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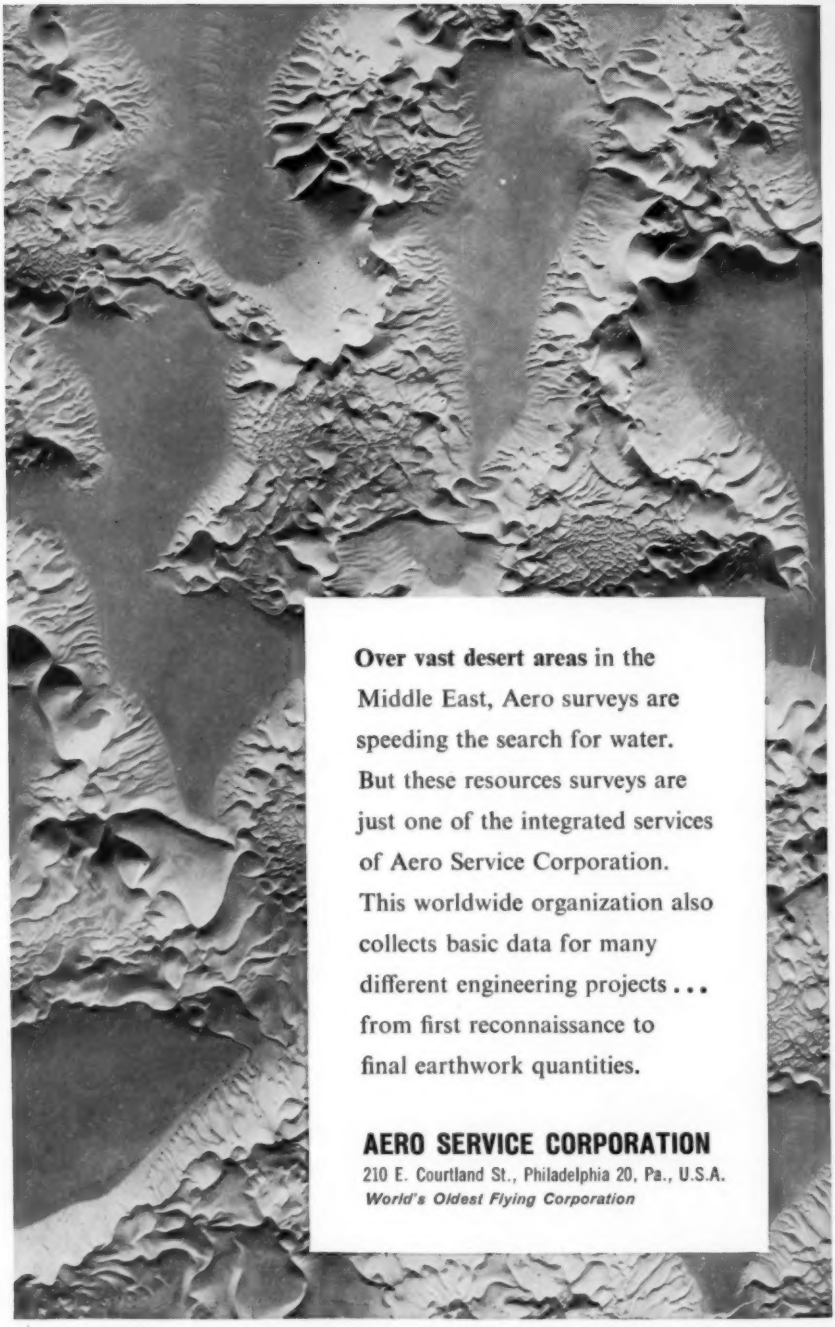

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SURVEYING AND MAPPING

Editor-in-Chief

Howard S. Rappleye

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March 1961

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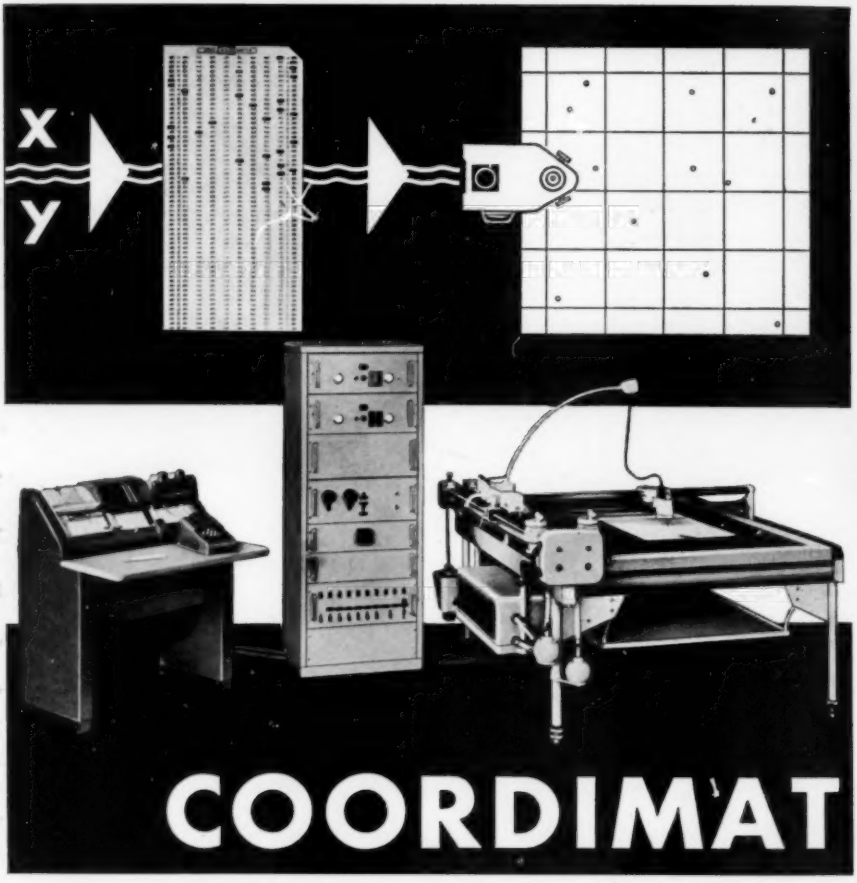

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Aerospace Cartography

By COLONEL ROBERT E. HERNDON, JR.

COMMANDER, AERONAUTICAL CHART AND INFORMATION CENTER, USAF

IN ORDER to introduce a study of Aerospace Cartography, it is first necessary to define the term "aerospace." The Air Force defines aerospace as an operationally indivisible medium consisting of the total expanse beyond the earth's surface.

It is the responsibility of the Aeronautical Chart and Information Center to provide cartographic and related data support for Air Force needs in keeping with today's technology. To begin, a description will be given of some of the cartographic items ACIC has produced for an advanced navigation system that still obtains its guidance from individual points on the earth. From this point, we will progress to special design problems, collection and evaluation of physical and scientific data, new techniques for compiling, and some of the charts and data that pertain to the more distant realm of aerospace.

High performance characteristics of modern aircraft created a firm requirement for continuous graphic presentation of precise position information throughout all phases of flight. Specifically, high speed, compounded by a minimum of working space in the newest aircraft, obsoleted the effectiveness of manual navigation techniques; and high altitude, all weather capabilities rendered visual navigation ineffective for all practicable purposes. To provide for this requirement, several semiautomatic chart display systems have been developed and are in use, either for tests or operationally.

The display devices used in these systems present integrated data (Figure 1) consisting of position and heading by an aircraft symbol that is superimposed over a chart image. This symbol, as an automatic function, moves across the graphic on the course and at a rate commensurate with the speed at which the aircraft is moving over the surface. Altitude and the attitude of the aircraft are shown on separate cockpit instruments.

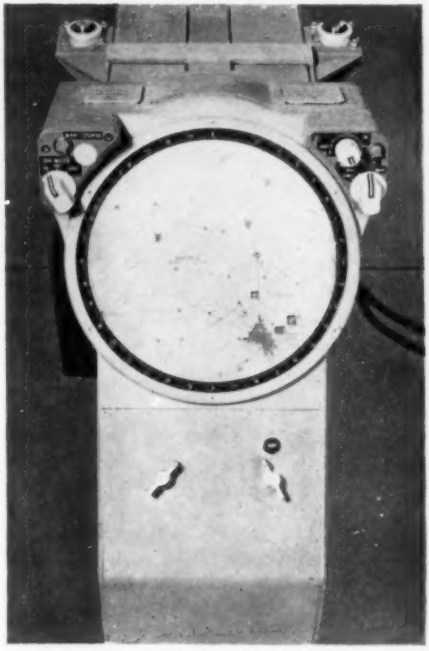


FIGURE 1.

The large number of charts used in these displays cover extensive geographical areas. The reduced images are stored in miniaturized form as monochrome photographic images on either film strips or glass slides, a cylinder, or a hemisphere. These are projected either optically or electronically onto the display area located directly in front of the pilot. Selection of charts is accomplished by a simple, manually operated switch and the aircraft symbol is correctly positioned on the new image automatically.

Presented at the 20th Annual Meeting of the American Congress on Surveying and Mapping, Washington, D. C., March 21–23, 1960.

Two types of charts are provided. A small scale chart contains only map and textual data required for high altitude enroute or operational area navigation. The larger scale chart (Figure 2) contains only the data required for terminal area and landing operations. Chart scales are established on the basis of the equipment magnification ratio, the distance from which the image is to be viewed, and the amount of information required to be portrayed for the specific mission phase to be satisfied. This necessitates close and continuing coordination between the system design engineers, the operational user, and the cartographer to assure that optimum products are provided.

FIGURE 2.

In addition to a film strip, one of the currently operational systems also requires cartographic support in the form of punched computer tape. These tapes contain pre-selected navigation information and are used to load the data into the magnetic storage drum of the airborne computer. In flight these data provide the primary input to certain automatic navigational functions of the system.

Obviously, this advanced operational navigation system of today is a forerunner to more sophisticated concepts and devices that will be required for space navigation by manned vehicles in the future. In any discussion of current and future guidance components, we very rapidly reach the point where these systems will provide man with the capability of escaping from the earth's gravitational attraction, even if only briefly as in the X-15, and which will carry him beyond what we know as winged or aerodynamic flight. ACIC is already providing cartographic support for the National Aeronautics and Space Administration (NASA) and McDonnell Aircraft Corporation (MAC) on Project Mercury. This is the project commonly referred to as the man-in-space project. More specifically, Project Mercury is considered by NASA to be a first step in the ultimate achievement of interplanetary space flight and the Mercury capsule vehicle a stepping stone to larger systems in the future.

To support some of the planned objective of Project Mercury, ACIC has provided the following assistance:

(1) Developed and produced the Mercury Orbit Chart—a small-scale Mercator chart upon which orbital information is overprinted.

(2) Recommended design changes for the 4½ inch globe in the Earth Path Indicator.

(3) Developed and produced a 70-mm. film strip Mercury Simulator Graphic for the Air Bearing Simulator now in use at Langley Field, Virginia, for astronaut training.

We are also at present investigating further requests by NASA in the following areas:

(1) Mercury Control and Recovery Center Charts.

(2) Mercury Range and Tracking Station Charts.

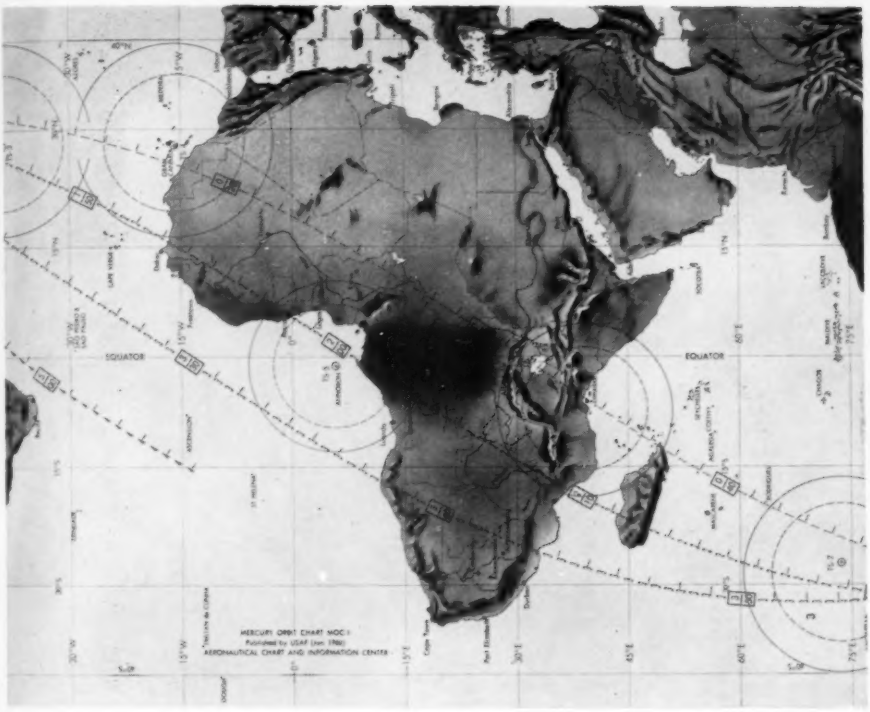


FIGURE 3.

(3) Advanced Simulator Graphics for use in training on advanced procedures and missions.

The Mercury Orbit Chart, designated the MOC-1, has been produced for use by NASA and the astronaut, both for examining some of man's capabilities in a weightless environment and for use as a back-up system for determining an impact position in the event the astronaut assumes manual control of the recovery procedures. Problems in the development of the chart may be considered to have fallen into two major categories:

(1) Portrayal of both terrestrial and orbital information on a small-scale chart for viewing at an approximate distance of twenty-five inches. The chart scale of approximately 1:52,000,000 was dictated by the necessity for portraying the earth's circumference from 40° North to 40° South latitude on a standard Mercator projection within the 7-inch width of a chart holder.

(2) Determination and selection of appropriate chart material and printing inks to meet the very rigid environmental factors which might be experienced by the capsule and its contents.

In conferences and discussions with representatives of NASA and MAC and specifically with several of the astronauts, general design criteria were formulated. It was determined that terrain features could probably best be portrayed by use of the generally accepted technique of landform coloration based upon major physiographic features and characteristics of the natural vegetation by geographic distribution. The three-color, process-color terrain presentation therefore gave a type of bird's-eye view from high above the earth. As a result of opinions by the astronauts and others that shoreline indentations, and island shapes

and patterns, may be valuable checkpoint aids at the 100–120 mile altitude, we have produced an exceedingly precise drainage and island portrayal for a chart of this scale. A graticule has been placed at fifteen-degree increments providing a satisfactory relationship to the rate of earth rotation and time. Criteria for selection of cities to be shown was based on general factors such as visibility to the astronaut by day, appearance at night due to artificial illumination, or strategic location in sparsely populated areas. In developing the colors and detail of the base chart, of prime importance was the necessity for maximum legibility of the orbital information to be printed over it.

After the design problems of base information portrayal had been resolved, the next task was to determine the best method of portraying all information related to orbital and tracking data. This included three successive orbits about the earth, elapsed time from launch along each orbit, retro-rocket firing points, retrograde paths, impact points, tracking station locations, and telemetry and voice communication ranges of each station.

Several methods for portraying anywhere from three to nineteen complete orbits were investigated. These methods included the use of colored lines, various types of line symbols, and combinations of the two. When none of these were considered satisfactory, it was decided to attempt a more revolutionary approach. A line symbol was constructed by elongating numbers from the standard Foto-setter type through use of a Bausch and Lomb rectifier. These numbers were then placed along a line through their vertical axes. Enlarged numerals on the orbit-line patterns were used to present "time from launch" in hours and minutes at ten-minute intervals along the orbit tracks.

The remaining portrayal of tracking station and recovery information such as symbolization of the re-entry, impact points, and tracking stations posed few problems. The results of our efforts to produce the initial chart for the first man in space is shown in Figure 3.

As yet, I have not explained some of the problems we encountered in finding suitable materials to meet the stringent environmental conditions. According to McDonnell Aircraft Corporation specifications, the materials in the capsule were expected to meet conditions such as the following:

(1) No softness, brittleness, etc., for temperatures ranging between -15 and $+200$ degrees Fahrenheit.

(2) No effects from excessive vibration, shock, and acceleration forces.

(3) No toxicity or discoloration through the above temperature range in a pure oxygen environment.

(4) No effects from relative humidities of 15 to 100 percent.

Space does not permit mention of many of the materials tested. Needless to say, a chart lithographed on regular chart paper would not be satisfactory, since the paper yellowed and ink colors changed appreciably under a 200-degree Fahrenheit temperature, pure-oxygen atmosphere. The best solution from a standpoint of economy, weight, and processing was determined to be the laminating of a standard lithographed chart between two thin sheets (0.001 inch) of Mylar plastic. After lamination the chart met all environmental tests with flying colors. In order to provide a nonglare surface upon which penciled notations could be made, the surface was lightly abraded with a fine rouge pumice.

We have continued development of certain aspects of this chart. For instance, after the Mylar surface was rubbed, the blue color used for shorelines and rivers became difficult to read. As a result, black has been used on later editions for shorelines and rivers, to provide improved legibility. It was also determined that the elapsed time should be placed in a box symbol and time ticks designated for each minute along the orbit tracks. As the Mercury mission varies in the future or as the duration of the flights become greater, the chart will change accordingly. As changes occur, the chart or the means by which it is carried in the capsule may vary from that described above, but the importance of cartographic information will remain.

Cartography is also important to another

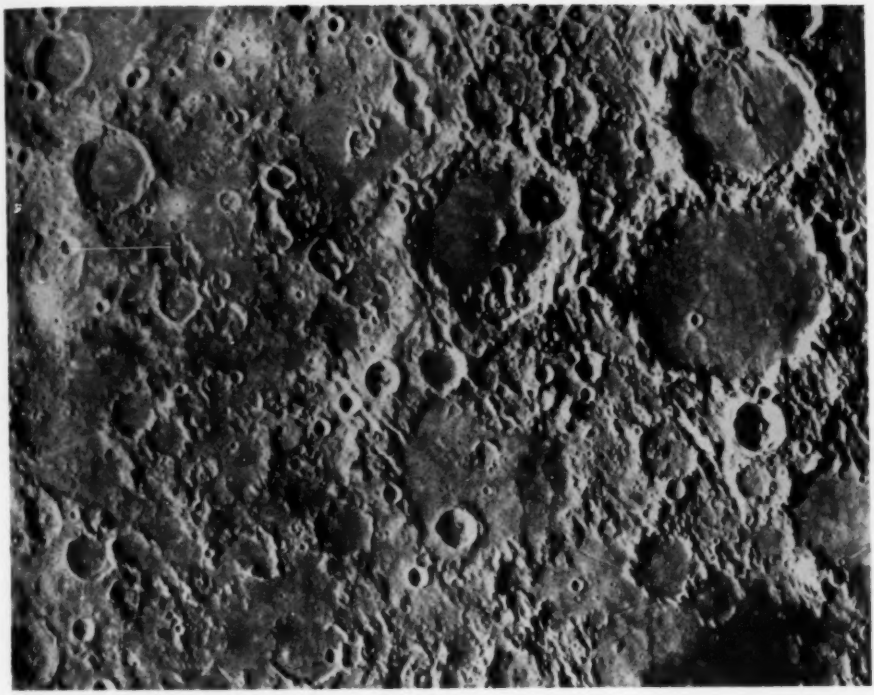


FIGURE 4.

piece of capsule equipment. This is an orientation instrument called the Earth Path Indicator. This indicator utilizes a small 4½ inch globe rotated by a clock-drive mechanism. When the correct rate of rotation and orbit angle to the Equator is set in by the astronaut, this indicator will continually present a general location over the earth's surface. The only input we have had, as far as the Earth Path Indicator is concerned, involved coordinating the design of the chart with the ultimate design of the small globe. The final version of the globe will use the same design and portrayal features as the chart.

Another product for the man-in-space project is the Mercury Simulator Graphic which we have produced for the Air Bearing Orbital Attitude Simulator now in use by the NASA Space Task Group, Langley Field, Virginia. This simulator is used to train the astronaut in such factors as manual control of the capsule, navigation, and, indirectly, in scientific observation and reporting. The astronaut maintains his attitude and orients the capsule along three axes by reference to an image of the earth below as it would be seen through the capsule periscope. At present this earth image is rear projected on a ten foot diameter screen. In front of the screen the image passes through a large fish-eye lens mounted below the astronaut's feet and then through a system of mirrors which finally present the periscope-like image. Our contribution has been the development and production of a continuous 70-mm. film strip which simulates the appearance of the earth from an altitude of 120 miles for slightly more than three successive orbits above the earth. The strip portrays in monochrome a path approximately 820 miles on either side of these orbits.

In producing this graphic we established

FIGURE 5.

each orbit as the center line of an Oblique Mercator projection. Land areas were then positioned approximately, and a join made at the intersection of each orbit. To this date we have produced only the first sample film, showing major land masses and islands. The land area contains only major relief features, major rivers, and large lakes. It may be noted that original criteria which called for portraying exactly what the astronaut will see in terms of detail and color were somewhat difficult to establish, because, as yet, no human eyes have ever looked down from this altitude. At the present time we are in the process of evaluating the original film strip and preparing for an improved version.

While we look forward to the scientific knowledge that Project Mercury will yield, we fully realize that this will only be our first step in space. In the very near future, it can be seen that our national interest will be increasingly concerned with the moon. In preparation for the day when asking for a lunar chart of the Copernicus crater region may be as common as asking for a World Aeronautical Chart today, the Air Force initiated several years ago a number of study projects related to cartography and observatory photography of the moon.

First, we have the recently issued USAF Lunar Atlas which is now being distributed to interested United States Government agencies. The Atlas contains the most complete lunar photography published to date, at a scale of approximately 1:1,370,000. The purpose of this study is to provide the best available photographic coverage of the moon as a basic contribution to the national space effort. Plans for the preparation of

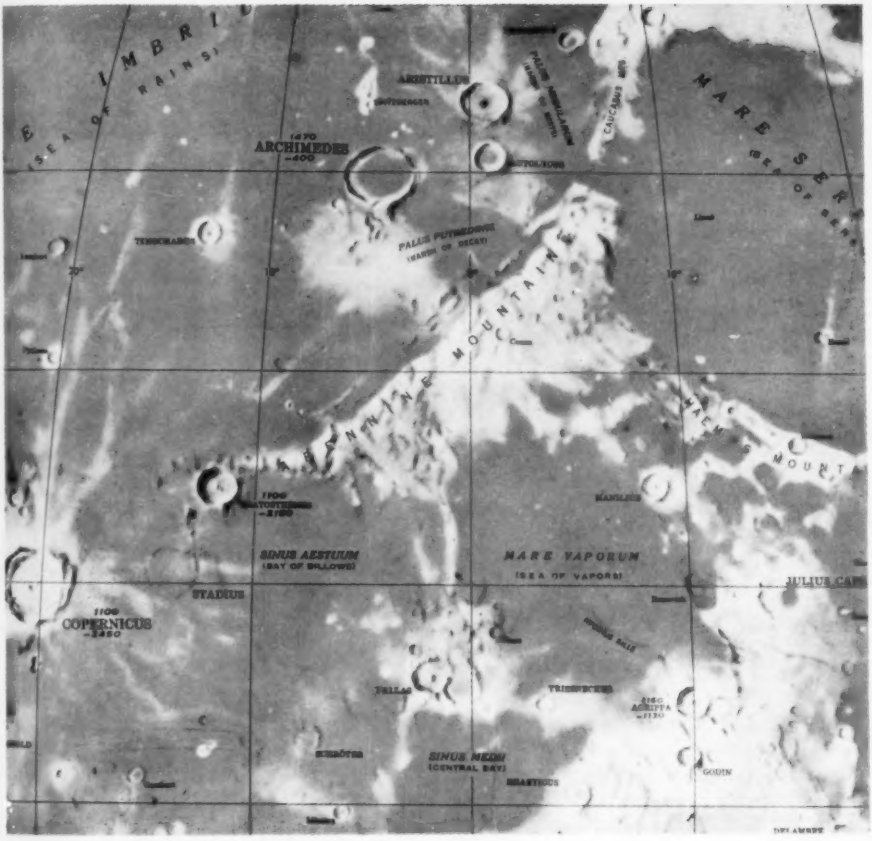


FIGURE 6.

this work were initiated in the fall of 1957 by the Air Force Cambridge Research Center (AFCRC). Dr. G. P. Kuiper, Director of Yerkes Observatory, undertook the task of supervising this work, and after evaluating 1,200 lunar photographs taken at Mount Wilson, Lick, McDonald, and Yerkes Observatories in this country, and the Pic du Midi Observatory in France, he selected 280 of the best photographs for publication. Briefly, Dr. Kuiper divides the visible surface of the moon into 44 fields, with each field covered by a minimum of four photographs taken under different illuminations.

Figure 4 represents a typical page from the Atlas. Each field contains at least four photographs of the same area, one morning and one evening view under moderately high sun, a full moon shot with high sun, and a supplementary view generally with low-oblique illumination. The different angles of the sun's rays cause some surface features to become clearer while others completely disappear from view. Figure 4 shows the area of the crater Hipparchus, demonstrating the variety and shape of numerous crater formations. In addition, 35 supplementary sheets provide additional coverage of the 44 fields.

The Introduction to the Atlas contains information on the quality of the prints and the history of the project by Dr. Kuiper, and a brief text on Lunar Physical Charac-

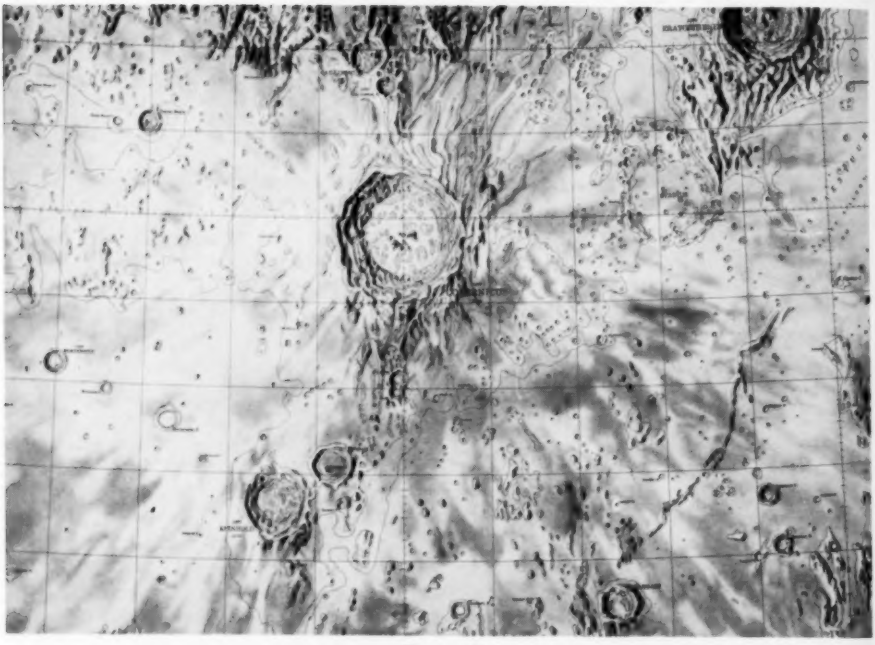


FIGURE 7.

teristics and Motions, as well as sufficient tables and identification keys to select appropriate photographs or to identify individual features by name. Several supplements to this Atlas are being considered, including a lunar orthographic map grid, "rectified" photographs of the limb areas, high quality photographs of selected areas at double the Atlas scale, replacement of lesser quality sheets in the Atlas, and a detailed lunar nomenclature.

Distribution of this Atlas for U. S. Government use is being accomplished by Aeronautical Chart and Information Center. An atlas containing substantially the same information as prepared by Dr. Kuiper is being provided for non-Government use on a nonprofit basis through the University of Chicago Press.

To evaluate and determine the kinds or types of cartographic materials that could feasibly be made from basic lunar data, using today's advanced cartographic techniques as applied to earth charting, ACIC has made several prototype lunar charts or mosaics.

Figure 5 is a blow-up of a section of the Lunar Reference Mosaic produced at a scale of 1:5,000,000. This mosaic has been constructed on an orthographic projection using the best photography available at the time, by laying the prime meridian and equator on an enlarged photograph of the full moon (Yerkes 108). Measurements were taken from the intersection of these lines to establish additional control points. Using the full-moon shot as a photo identifiable base, supplementary photos were selected for their sharpness of features and mounted. Partial rectification was accomplished to position the imagery to the control base. The Lunar Reference Mosaic has also been printed in a reduced version at 1:10,000,000 scale.

Figure 6 is an enlarged section of the USAF Lunar Reference Chart, also scaled at 1:5,000,000 on an orthographic projection. Outline type features have been ren-

dered by generalized shaded relief, relative elevations, and gross surface color variations. Feature alignment and relief were developed by careful analysis of lunar photography. A color background plate was made by means of airbrush technique, based on analysis of full moon photography, and depicts the relatively light areas and systems of crater rays. Craters are shown by means of conventional shaded relief techniques assuming a single light source.

Figure 7 depicts examples of detailed hand-sketched lunar charts available up to this time. The highly regarded Schmidt's work was completed in the latter part of the last century. Lunar materials of this kind are still referred to by astronomers in the conduct of their lunar observations. The other example is the work of Fauth, a German astronomer and excellent draftsman, who labored long hours at the telescope. By way of comparison, Figure 8 contains

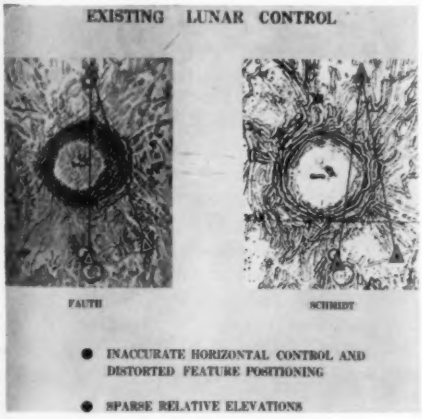


FIGURE 8.

the same Copernicus region as shown on an ACIC prototype lunar chart at 1:1,000,000 scale. This demonstrates our portrayal techniques for lunar surface characteristics. Remember though that our compilation is based on photo coverage of the area while Schmidt and Fauth drafted their maps as they observed the moon's surface through telescopes.

In the Lunar prototype effort, surface features are rendered by a combination of shaded relief, contours, and tones representing surface color variations. While the shaded relief is considered representative of the actual lunar terrain, the contours are form-lines with arbitrary values assigned to demonstrate contouring representation. The chart was constructed by adjusting photo detail to control at 1:1,000,000 scale. In addition, a background plate was rendered by airbrush technique to develop the relatively light areas and systems of crater rays. Conventional shaded relief techniques were employed. Rim heights and crater depths are expressed in feet, and the numerical values are printed above and below crater name. Elevations are relative, that is, related to the level terrain surrounding each crater. Reference documents for these elevations were Baldwin's "The Face of the Moon" and Wilkins' and Moore's "The Moon." A variable contour method is used throughout the chart, with blue contours below and brown contours above the arbitrary datum plane. Chart detail was positioned by basic control measurements established by J. Franz and S. A. Saunder, and published under the auspices of the International Astronomical Union in 1935. The limits of this chart conform to a sheet layout system we have made for the entire lunar surface. Present prototypes at 1:1,000,000 scale have the conventional 22″ × 29″ sheet size.

We are also considering a system of sheet lines that would be suitable for covering the entire moon in six sheets on a gnomonic projection. Everyone will be interested in that sixth sheet that covers the back side of the moon.

After a careful analysis of what has been accomplished by means of cartographic prototypes, the next logical question to be answered is—How can these basic lunar materials be improved, both from the standpoint of control and delineation of surface features? This leads to a discussion of basic lunar data. In order of importance, the first is improved selenodetic control.

The precise determination of horizontal position of specific points on the lunar surface and the determination of the absolute

elevation of such points poses a real problem. Referring again to Figure 7, we see that existing selenodetic control contains sizable errors recognized by present day astronomers as a magnitude of two miles or more in horizontal dimension, and elevations that are not referenced to an established vertical datum. Early mapping efforts by astronomers were done at the telescope without control as normally used by cartographers. The Fauth and Schmidt lunar maps show major differences in positioning of features when compared to control now available. Relative heights are indicated for only a small percentage of the prominences.

The photography that is available for the identification and measurement of selected positions must be enlarged by a factor of ten to thirty, and a great majority of it lacks geometric stability and reasonable resolution of detail beyond the scale of 1:1,500,000. A normal assumption would be that basic position could be resolved through stereophotogrammetric methods. Unfortunately, the 240,000 mile distance of the moon from the earth practically eliminates divergent angles. Only a slight parallax angle is apparent, even on photographs taken at the extremes of libration, or "wobble" of the moon as it orbits the earth. If photographs were taken at opposite sides of the earth's 8,000 mile diameter, only an insignificant increase in parallax would result. Consequently, stereophotogrammetric reduction is difficult.

Although existing source materials are somewhat deficient, they provide the necessary background for lunar knowledge. Fifteen hundred maps, books, documents, reports, and studies; 184 lunar photographs in the form of glass-plate or stable-film negatives selected from the collections of Lick, Pic du Midi, Mount Wilson, McDonald, Yerkes, and U. S. Naval Observatories; 4,500 horizontal positions evaluated and transformed by electronic computer to selenographic latitude and longitude; and some 600 relative relief determinations constitute present ACIC library holdings. Five thousand new high resolution photographs, accomplished with relative relief determination in mind, have been made available to us and the procurement of additional photography has been arranged. Arrangements have also been made to acquire the higher quality data being produced by various astronomers and selenographers.

Basic techniques for the reduction and integration of various works completed or in process by selenographers of authority, both here and abroad, are being devised by the Space Flight Physics Laboratory of the Geophysics Research Directorate, Air Force Cambridge Research Center, in collaboration with the ACIC. Several types of control reduction are needed to refine progressively the existing data and eventually extend these data to test and validate the techniques devised. A spherical figure of the moon should be used in the reduction processes although the moon is assumed by some to be a triaxial ellipsoid. The fact that elongation of the longest axis is of a very small magnitude whereas undulations of the surface are relatively large justifies this premise. Limb corrections and formula for a refined moon radius, resulting from a survey of the marginal zone of the moon conducted at the United States Naval Observatory by Dr. C. B. Watts, will be available for integration into the analytical reductions to improve the accuracies. Selections can be made from the 4,500 points expanded by Franz and Saunder from the eight heliometric measured basic control points by Franz. All positions are contained in the control list approved by the International Astronomical Union. This control has been transformed by computer to selenographic latitude and longitude and then plotted by electronic plotter. Control can now be measured with precise comparators on lunar photographs and analytically reduced to refine it to a reasonable cartographic accuracy. Additional control will have to be abstracted directly from topograms of Dr. Watts' survey in the marginal zone and additional positions selected and measured in the central regions to complete the control pattern. ACIC has given technical assistance to Dr. Watts' moon survey program since 1954.

A concurrent program of relative relief

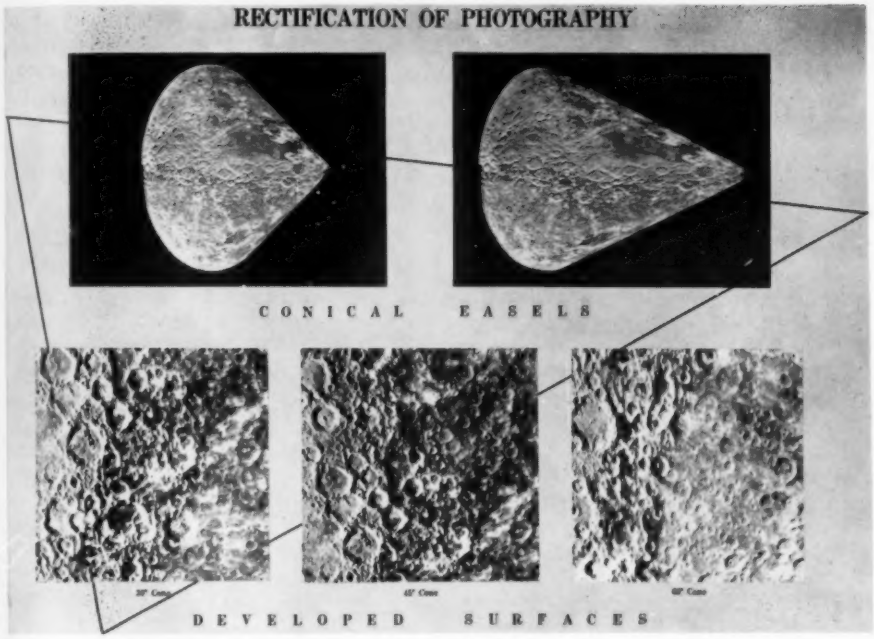


FIGURE 9.

measurements over the visible disc of the moon is necessary to provide worthwhile information in respect to fluctuations of the lunar surface and add considerable refinement to basic horizontal and vertical control.

Air Force Cambridge Research Center sponsored the development of a shadow progression technique to obtain relative heights of lunar prominences in the central portions of the visible disc of the moon. This new technique has now been developed under the direction of Dr. Kopal, University of Manchester, to the point that it can achieve relative height accuracies of from 100 to 200 feet. Over 5,000 photographs for such work are now available to ACIC and additional photography required will be accomplished at the Pic du Midi Observatory through the University of Manchester. Precise recording microdensitometers are available to make progressive measurement of cast lunar shadows, and electronic computers can then reduce the data. The University of Manchester has agreed to provide technical coordination and assistance. It is interesting to note that this work indicates that the moon's surface is not nearly so rough as it appears.

Data from Dr. Watts' moon survey can be used to establish supplementary elevations in the marginal zone. Heights of prominences and data to establish a vertical reference plane can be abstracted from his work.

Height variation in the maria must also be considered in order to complete the relief analysis. The Van Diggelin method of determining slopes and heights of ridges in the maria by measuring the devations from the mean brightness distribution is a possible solution. Also, star occultations against the maria in the limb region would prove the degree of flatness.

The ACIC variable perspective camera (Figure 9) has been adapted for the rectification of lunar photographs. The projector lenses are set at the focal plane of a curved mirror resulting in a column of parallel light

rays with a depth of focus that is theoretically infinite. Hemispheres, cones, or cylinders of various dimensions may be inserted in the path of the parallel rays and semi-rectified photo imagery abstracted at desired vantage points up to a perpendicular to the optical axis of the system. Photo-sensitized paper is placed directly on easels of simple curvature and rephotographing accomplished on easels of double curvature. Additional rectification can be accomplished through the use of normal rectification equipment to fit plotted lunar control.

This introduction to lunar cartography has been presented to and discussed with NASA. It represents an Air Force capability in an area of great significance in the national space effort.

Briefly, I would now like to conclude my paper with a subject that is even further out in aerospace.

With the advent of the aerospace age, coupled with the basic support mission of the ACIC for providing the USAF navigational materials and geodetic data, it is now necessary that we devote thought to the future needs of space navigation. An important requirement which we foresee is the need for Space Referencing Systems meeting requirements for initial, mid-course, and terminal navigation; and also for compatibility with the nature of the mission.

From past experience and basic knowledge we all recognize that a fundamental difference between navigation in space and navigation on the surface of the earth is that space navigation is a three dimensional problem whereas earthbound navigation is basically two dimensional. In space, the third dimension is equally important with the other two, and there is no provision by nature to distinguish any one of the three dimensions from the others.

Other factors which will bear on the navigational problem in space are:

(1) Ability to precisely measure angular relationships.

(2) Adoption of a standard unit for distance measurements.

(3) The possibility of a need for a different unit of measurement for time.

As an initial effort, we are engaged in a review of the characteristics of several systems which could conceivably meet the needs of space referencing. One of these systems is the Geocentric Equatorial Coordinate System.

The origin of the geocentric coordinate system (Figure 10) lies in the center of the Earth, the equatorial plane serving as a

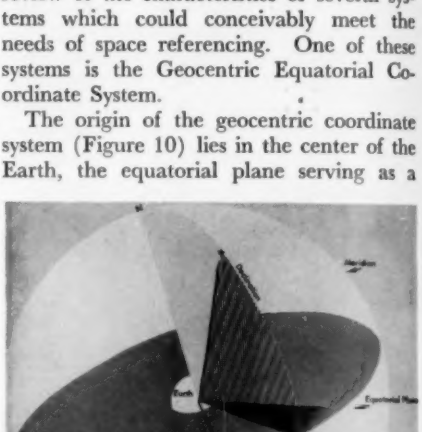


FIGURE 10.

reference plane. The position of the body is measured by the two angles called right ascension, measured eastward from the vernal equinox (Υ), and declination, measured from the equator either toward the North Pole or toward the South Pole. North Pole and South Pole symbolize the extension of the Earth's axis to the point of intersection with the celestial sphere.

If the Sun is the center of attraction, an alternate geocentric system used is the Geocentric Ecliptic Coordinate System (Figure 11) based on the Earth's ecliptic plane as a reference plane. One must distinguish between geocentric ecliptic and geocentric equatorial coordinates. The geocentric ecliptic coordinates are called Longitude and Latitude, like the Heliocentric coordinates. The point from which longitude is counted (in the eastward direction) is always the vernal equinox. The latitude is measured from the ecliptic plane along a meridian, either toward the north (above) or south (below) the ecliptic plane. Above is

counted positive, below is counted negative.

Lastly, we have a Heliocentric Ecliptic Coordinate System (Figure 12). The origin of the Heliocentric Ecliptic Coordinate System lies in the center of the Sun; the ecliptic plane, the plane of the Earth's orbit, serving as the referencing plane.

Indicated in the diagram are the equinoctial line ($\Upsilon - \simeq$) and the nodal line ($\mho - \Omega$) both of which must pass through the Sun (S). (P) designates the perihelion and (B) the body in orbit. Any point in the orbit can be determined by the polar coordinates in the ecliptic system, i.e., the heliocentric longitude (l) and latitude (b).

These are some of the possibilities for space referencing. Other systems such as Topocentric, Terminal Centered, and Flight Path Oriented are worthy of consideration. Extensive basic work has progressed in this field through efforts of the Air Research and Development Command and the scientific community. The Air Force Air Photographic and Charting Service and ACIC are accomplishing investigation and evaluation contributing to the resolution of space referencing systems. The task represents a challenge that must be met to meet the demands of the future.

For this paper, I have introduced some of our newer kinds of work. Perhaps it seems strange that the Air Force should now be concerned with such as lunar cartography. Experience has indicated that we must have a firm grasp of what can be done with whatever exists. In this way, we are prepared to help the national space effort.

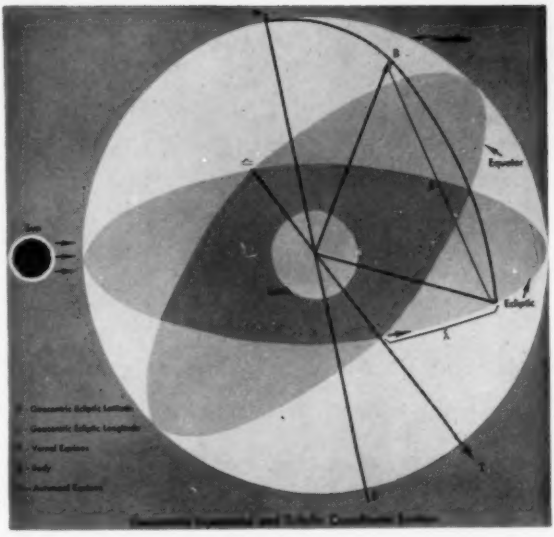


FIGURE 11.

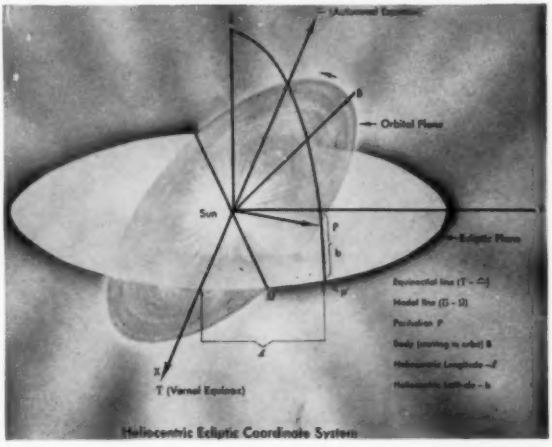


FIGURE 12.

As space technology advances and permits more complete fulfillment of the use of space vehicles, the needs placed on aerospace cartography will become more complex and more demanding. Only through close collaboration with the scientific fields involved can cartography fulfill its role in aerospace.

1961 Antarctic Research Program

WASHINGTON, D. C., November 2, 1960—Secretary of Commerce Frederick H. Mueller outlined today Department of Commerce plans for continued participation in the U. S. Antarctic Research Program for 1961, as sponsored by the National Science Foundation. During the Antarctic phase of the recently concluded International Geophysical Year, and since then as a part of the U. S. Antarctic Research Program, three scientific agencies of the Department of Commerce have actively participated in basic and applied research on the Antarctic Continent.

The Coast and Geodetic Survey has been engaged in geomagnetic and seismic investigations, the Weather Bureau has conducted programs in meteorological research, and the Bureau of Standards has done extensive work in ionospheric studies. Actually, the Department of Commerce is responsible for more than half of the scientific personnel assigned on a "wintering-over" (annual) basis to the U. S. Antarctic stations.

In connection with the Coast and Geodetic Survey's phase of this year's Antarctic Research Program, Rear Admiral H. Arnold Karo, Bureau Director, is now visiting the ice-bound continent to review the scientific programs of the Survey.

Four Coast and Geodetic Survey scientists will take part in the 1961 program. John Lamping of Imperial, Missouri, has been assigned to the South Pole station to carry out the geomagnetism and station seismology programs. David Perkins of Dahlgren, Virginia, will conduct similar scientific programs at Byrd station.

For the first time, Coast and Geodetic Survey geophysicists have been assigned to the over-snow traverses organized by the University of Wisconsin. The first of these two scientific traverses will explore 1,200 miles of the South Polar plateau and the second will make geophysical observations on the Ellsworth Highland. Regular measurements will be made of the basic physical features of the continent, including elevations, ice thickness, character of the rock under the ice, and also gravity, magnetic, and astronomic observations.

Herbert Myers of New York City will represent the Coast and Geodetic Survey on the trip from Byrd station over the Ellsworth Highland to a point near the Bellinghausen Sea. His Bureau associate, Ardo Meyer of Arlington, Virginia, will accompany the party leaving the McMurdo base, travel across the Victoria Land Plateau, and conclude the journey at the South Pole.

In addition to the above programs, Coast and Geodetic Survey personnel will cooperate with Australia at Wilkes station on the Knox Coast and with New Zealand at Hallet station.

WASHINGTON, D. C., October 1, 1960—The Department of the Interior announced today that seven scientists from the Geological Survey have been detailed to participate in the current season's topographic mapping effort in the Antarctic.

As part of a $300,000 Antarctic mapping program in cooperation with the National Science Foundation, the seven men have been detailed to collect data for the preparation of topographic maps and to serve as navigators on traverse parties engaged in other scientific work. Transportation and logistical support is to be provided by the U. S. Navy. The men will begin leaving for the Antarctic early in October.

Joel H. Langhofer, Washington, D. C., will accompany an ice-breaker expedition to the Bellinghausen-Amundsen Sea area.

Peter F. Bermel, Rolla, Mo., will accompany a traverse party operating in the Horlick Mountains.

Thomas E. Taylor, Denver, Colo., is to accompany a traverse party that will travel along the west side of the Ross Ice Shelf.

Joe M. Anderson, Denver, Colo., will join a scientific party in the Jones Mountains east of the Thurston area and in the Sentinel Mountains.

William R. MacDonald, Washington, D. C., will take care of liaison work on aerial photography with the Navy.

Leslie B. Robison, Cape Girardeau, Mo., and George R. Staeffler, Denver, Colo., will work out of McMurdo Air Facility to determine positions and elevations in the mountains along the west side of the Ross Ice Shelf. They will be responsible for establishing geographic positions of points on the ground in the Taylor-Wright Valleys and in the mountainous areas to the north and south. As the season progresses, Staeffler will fly out to join the South Victoria Land traverse party when it swings eastward toward Queen Alexandra Range.

Identification of Title*

By WILLIAM H. BAKER, JR.

LAWYERS TITLE INSURANCE CORPORATION

WE in the title insurance industry feel a very special kinship with and dependency upon you in the surveying profession. We both deal with the same commodity—real estate. Basically, our concern is with title—but it must be title to something that is identifiable or else it is meaningless. One of your functions is to assist in that identification, but, in so doing, you must first determine what the parties think they have title to, and under our system of land transfer you will have certain recorded documents to rely upon, which on occasion can be more confusing than helpful. Then you determine what the parties have actually been occupying on the ground. The reconciling of resulting differences can be productive of substantial problems. This, in turn, points up the interdependency of our two professions.

By our title insurance policies we undertake to say that we will insure the purchaser or the mortgagee against loss or damage by reason of defects, liens, or encumbrances affecting the title to the land therein described. The insuring provisions are so broad that they cover not only the matters that a careful examination of the recorded title would disclose but also the examining attorney's erroneous conclusions of law, and the forgeries, frauds, and other off-the-record matters that the attorney, no matter how careful, cannot discover.

Nowhere in the printed context of the standard owner's and mortgagee policies of title insurance issued in Virginia today does the word "survey" appear. Nevertheless, the insuring provisions are so broad that in the absence of a typed exclusion from coverage they embrace coverage against loss or damage that the insured would sustain as a result of any adverse matter that would be disclosed by a survey and inspection of the premises. This exclusion from coverage is generally accomplished, at least in mortgagee policies, by a typed exception reading: "Such state of facts as would be disclosed by an accurate survey and inspection of the premises." If the policy is issued without that exception, we accept liability for possible loss from encroachments, family graveyards, deficiency in quantity of land, adverse occupancy of part of the property by a neighbor, variances between title lines and lines of occupation, adverse rights of user by utility and pipeline companies, and any of the many other matters that might be discoverable from survey and inspection and not be evidenced of record.

We have had almost as many graveyard claims as claims by wives who were impersonated by someone else when the husband sold or mortgaged the homestead.

Twenty-five years ago the mortgagee more often than not accepted the policy with the typed exception I have quoted. Today, acceptance of a policy containing such exclusion from coverage is the exception rather than the rule, and with the elimination of this exception and the resulting assumption of risk you can readily appreciate the title insurer's concern with your problems.

In some areas we encounter an alarming situation in that the older surveyors are dying off and qualified young men are not adopting the profession as a career. We have encountered some areas where, in order to procure a competent survey, it is necessary to import a surveyor from a community several counties away. We have other areas where there may be an adequate number of professed surveyors, but, because of lack of adequate training or adequately maintained standards, few, if any, are qualifield to make a competent survey.

* Excerpts from a paper presented at the Eleventh Annual Meeting of the Virginia Association of Surveyors, Inc., Old Point Comfort, Va., February 7, 1959.

We have an alarming number of areas where the rate-cutting surveyor is ruining his profession. He is ruining his profession by cheapening the product to the point where no intelligent young man is going to waste his talents in work that returns only a subsistence standard of living. He is ruining his profession by destroying the faith and confidence of the public in the accuracy and quality of his work. None of us is so naive as to think that a five-dollar survey or a ten-dollar survey is anything more than one pays for. I do not mean to imply, however, that the surveyor alone is at fault. To the contrary, he is primarily a victim without adequate professional support or means with which to fight back. No, I think those principally at fault for fostering and putting up with the situation are three in number. First, those mortgage loan originators who, in order to keep costs down and gain a competitive advantage, shop for the cheapest possible paper representation of a survey without regard to quality; second, those governmental agencies that prescribe the prices which borrowers under their programs may pay for various services; and, third, those title insurers, and I regret to say that we can be numbered among them in certain areas, that permit themselves to be coerced into accepting and relying upon these surveys that may represent no more than someone's office dream.

It has been suggested that I might give you some examples of losses which we have sustained on account of surveys, and I promise not to throw the whole load at you. I will, however, give you a few brief examples and ask you to believe me when I say that the problems for the title insurer resulting from the assumption of survey risks are rapidly increasing in number, and are each year accounting for a higher percentage of our dollar loss, which, incidentally, now ranges between $250,000 and $300,000 in the aggregate per year.

In one recent instance, claim has arisen under an owner's policy issued in 1941. The southern boundary of the land acquired by the insured was supposed to follow the run of a creek through swampy ground. The survey submitted to us, pursuant to which the deed was drawn, described it by course and distance. When the insured recently fenced his property, he followed the survey lines and immediately encountered difficulty with the adjoining owner. On investigation and new survey it was discovered that the 1941 survey would not close, that it gave a quite different course for the run of the creek than did a prior plat of record, that, in fact, the surveyor had followed the southern edge of swamp and not the run of the creek, with the result that the deed purported to include more land than the former owner had the right to convey. To resolve this case, the company incurred attorney's fees, court costs, additional surveying charges, and settlement with the insured for the value of the lost acreage.

In another recent instance not yet fully settled, claim has arisen under an owner's policy issued in 1950 on vacant land purchased by one of the national oil companies. In this case the property was triangular in shape and lay at the intersection of two roads, one of which was supposedly 50 feet wide with an 18-foot paved strip. The survey, by which the property was conveyed and upon which we relied, described the property with reference to the street lines as the only monuments or ties. By mistake the 50-foot street on the north was located with reference to the centerline of the paved strip whereas the true centerline was some 2 feet off the centerline of the paved strip. This resulted in an error in the location on the ground of the true west line of the triangle, with the subsequently constructed filling station encroaching upon the adjoining property. We anticipate aggregate loss of $1,300 or $1,400 of which $265 has already been paid out in additional surveying charges.

In 1954, we insured title to eleven adjoining lots of improved land for the benefit of both owners and mortgagees in reliance upon surveys that showed no encroachments and that indicated the houses were located at least five feet from each side line and therefore in compliance with the restrictions.

The lots all fronted on the east side of a street in a long block. There was a 16-foot-wide platted but unimproved alley on the north side of the northernmost of the eleven lots. Recently, new surveys for new loans on a couple of these lots have disclosed that, by error, each house is so located that, in order to comply with side-line restrictions, its lot must enclose four feet of the lot on the north. The northernmost of the eleven lots must enclose four feet of the alley. The city would not consent to a vacation of the alley, but would consent to a relocation. Accordingly, in order to straighten out the situation, we procured the execution of a number of new deeds and mortgages, bought—at a terrific price—a four-foot-wide strip on the north side of the alley, and finally obtained the city's cooperation in the relocation of the alley.

We have had many graveyard claims, some where the attorney failed to report a record reservation, some where there was no evidence of record or on the ground until excavations disclosed the existence of bodies, and some where the evidence consisted of mounds and headstones overlooked by the surveyor. An example of the latter is before us now and promises to be somewhat difficult unless it can be shown that the insured knew all about the graveyard at the time of his purchase. This involves a tract of acreage land with a beautiful view of nearby mountains. After the graveyard was discovered, it developed that the insured bought the property as a site for a motel, that the graveyard is situated on the highest knoll, and that this knoll is the only place the motel can be built and receive the greatest advantage from the view. In this case, neither the plat nor the surveyor's report on our form disclosed the existence of the graveyard, although it is clearly visible in a small grove of trees if you go to the top of the knoll and pass through some surrounding underbrush.

What, then, does a title insurance company expect in a survey? We do not pay your charges, but it isn't enough to say that on that account we have no right to expect anything of you. Our customers are your customers and we are both working toward the same end—the satisfaction of the customer in such manner that each of us will get future business from him or from others with similar needs. One of the principal reasons for the growth of title insurance is that the modern investor in mortgages no longer is the local banker who knows the borrower and his father before him, the property and its past history, and the local examiner. The national investor is remote from the scene; deals with cold, hard cash; and now wants the indemnity of a financially sound insurance company behind the title. By like token, the national investor no longer knows the local surveyor and is unwilling to accept a plat supported only by a local recommendation as to the ability of the surveyor. The investor is insisting upon that survey being suported by the indemnification of a financially sound corporation. The simplest approach is to insist that such protection be included in the title-insurance package. We, therefore, must insist that we be furnished competent, trustworthy information that is responsive to the risks we assume. One of the fallacies of this whole problem is the urgent insistence by mortagagees and others that no one is taking any risk because the loan will be paid off. We all hope that such will be the case and, happily, that has been pretty much true for the past twenty-five years, but many of us can remember a time when that was not the case at all. As title insurers, we have to remember not only the possibilities of loss which we have under our insurance contracts even in the case of healthy loans, but also that, if our mortgagee insured has to foreclose and buys in the property, the title policy that he holds automatically converts as of its date into an owner's policy under which liability continues for an unlimited period. So it isn't enough for the surveyors to say to the title insurer that, while our best efforts are labeled "A," since your risk is only under a mortgage policy all that you need is quality labeled "D."

My company has long had and required a form of surveyor's report as a supplement to a plat. The content of this form was adopted almost verbatim by other title insurers and by the Federal Housing Adminis-

tration. Most, if not all, of you are familiar with this form and will recognize, as we do, that the instructions on the back thereof call for the optimum in a survey, to be strived for but not necessarily always attained. In many cases of loans on residential lots in developed subdivisions, we will dispense with this supplementary certificate or report if the plat itself is adequately certified. This does not mean that we are evidencing a willingness to sacrifice quality, but rather that we are hopefully putting the same faith in the plat alone that we might normally put in the plat and the report together.

Briefly, then, when we rely upon a plat of survey for the issuance of our policies without the exception to matters of survey, we expect:

First of all, that the plat represents the results of the surveyor's conscientious efforts in the field on the ground;

Second, that the surveyor has located the property on the ground strictly in accordance with the record description when the description gives adequate points of reference;

Third, that, when the surveyor can follow lines of occupation only, such fact will be adequately reflected on the plat itself;

Fourth, that in either event the plat will be tied in with some permanent monument, and if the property is shown on a recorded map of subdivision that fact will be recited and any easements shown by the plat of subdivision will be reflected;

Fifth, that such plat will clearly evidence discrepancies between record title lines and lines of occupation, such as the fact that the property owner, by mistake or otherwise, has erected his own fence or planted his own hedge several feet inside his property line. If the condition is permitted to exist long enough, the adjoining owner may acquire title to the unoccupied area by adverse possession. In 1953, the Supreme Court of Maryland said, in *Tamburo* v. *Miller*, 203 Md. 329:

"The modern trend and the better rule is that where the visible boundaries have existed for the period set forth in the statute of limitations, title will vest in the adverse possession where there is evidence of unequivocal acts of ownership. In this view it is immaterial that the holder supposed the visible boundary to be correct or, in other words, the fact that the possession was due to inadvertence, ignorance, or mistake, is entirely immaterial."

In the Tamburo case, the adverse possession was evidenced by fence enclosure and construction of a boathouse. But in *Erwin* v. *Brown,* decided by the same court a year later (204 Md. 136), the same result was reached when the adverse claimant occupied up to a hedge placed by the adjoining owner inside his line;

Sixth, that such plat will clearly evidence any encroachments, all visible easements of passage or for utilities, and any other matters apparent from an inspection of the premises, including graveyards;

Seventh, that the surveyor will give his customer and the title insurer the benefit of the knowledge that he has of adverse matters affecting the property which may not be apparent on the ground. Our exposure with respect to buried pipelines not evidenced of record, encroaching septic tank fields, and similar matters can be considerably minimized merely by the surveyor making known the off-the-record information that he might happen to have as to the particular property; and

Finally, that the plat will clearly show the kind of buildings on the property and the set-back from the property lines of the nearest points thereof. With this information, the insurer can then determine whether it can comply with the requirements of mortgagees, FHA, VA, FNMA, and others for insurance, with specific regard to compliance or noncompliance with applicable restrictions.

In conclusion, therefore, may I make a few suggestions that might tend to our mutual advantage:

First, it would be most helpful to the layman, the mortgagee, and the title insurer if there could be some standardization of terminology as used by your members in the description of your surveys, with publication of the meanings of the adopted terms. We receive plats labeled "Plat of Survey," "Loan Survey," "Location Sur-

vey," "House Location Survey," "Boundary Survey," and the like. Frankly, we do not know what kind of animal we have and we are afraid that there may be as many different meanings as there are titles and individuals using those titles;

Second, that there be some standardization in the form and meaning of the certification appearing on a plat of a survey. Speaking for my company, we would be delighted to work with you on this if we can be of assistance; and

Third, that you continue without diminution your efforts to increase the requirements for membership in your profession and to improve the training and qualifications of your members to the end of increasing public confidence in your work and increasing the value thereof to the public and to yourselves.

Kentucky Invests in Maps for Its Future

The State of Kentucky with the U. S. Geological Survey, cooperatively, invested $10,000,000 in Statewide coverage of topographic maps at the scale of 1:24,000, a project completed in 1956 and totaling some 763 quadrangle maps covering 40,395 square miles and requiring about seven years to complete.

Kentucky now plans a $12,000,000 cooperative program of geological mapping which will be based on the topographic maps upon which the geological scientists of the State of Kentucky and the U. S. Geolgical Survey will depict the geology of the Blue Grass State.

Kentucky plans to develop its natural resources.

Kentucky does not know the total wealth of its natural resources, but it is evident that Kentucky does know that such wealth over the years will be far greater than the cost of the surveys and maps necessary to develop the resources or even locate them.

Kentucky has a fair idea of the worth of a map or survey.

Kentucky is the only State of its size to be completely covered by modern topographic maps at the 1:24,000 scale.

The Tennessee Valley, the natural watershed developed by the Tennessee Valley Authority whose seal reflects *progress through resource development,* is another vast area covered by modern topographic maps at a scale of 1:24,000 and another case proving the value of topographic maps.

—W. S. Dix

"Engineering Outlook"

Another publication has made its bow. *Engineering Outlook,* Vol. 1, No. 1, March, 1960, is the first issue of this new publication, which, perhaps, may be best described by quoting from "A Self-Introduction" on page one of the issue.

"*Engineering Outlook* is a new publication of the Engineering College, and this is the first issue. It is published by the Office of Publications of the Engineering Experiment Station, the branch of the College which administers the research programs. It will report on various facets of these programs, such as new research facilities and equipment; current inventions and discoveries of widespread interest; and details about research which concern industry, national defense, or the private individual. In addition, information about educational policies, techniques, and facilities that are of public interest will be reported.

"Lastly, *Engineering Outlook* will describe current publications of the Engineering College. It will replace the publications "notification" which many of you have received in the past, and will now serve as the sole vehicle for such notification.

"*Engineering Outlook* will be published when there is enough news of interest to our readers to make up an issue, which should approximate one issue every four to six weeks. It will be sent without charge, on request, from the Engineering Publications Office, 114 Civil Engineering Hall, University of Illinois, Urbana, Illinois."

EDITOR'S NOTE.—*Engineering Outlook* will be received at the editorial office of SURVEYING AND MAPPING, will be scanned regularly, and, if any items of particular interest to readers of this Journal are noted, arrangements will be made to pass on the information. So please do not flood the publishers of this new sheet with requests for it just because it is free. We warn you —there will probably be a relatively small amount of material published in the new paper which will directly concern the surveying and mapping field.

World Adopts New Standard of Length

At 6:00 p.m., Paris time, October 14, 1960, the world adopted a new international standard of length—a wavelength of light—replacing the meter bar which has served as the standard for over 70 years. The action was taken by the 11th General Conference on Weights and Measures, meeting in Paris at the time.

The new definition of the meter as 1,650,763.73 wavelengths of the orange-red line of krypton 86 will replace the platinum-iridium meter bar which has been kept at Paris as an international standard of length since 1889 under the Treaty of the Meter.

While not of great concern to the man in the street, the action of the General Conference is of great importance to those engaged in precision measurement in science and industry. For many years the world has relied on a material standard of length—the distance between two engraved lines on the International Meter Bar kept at Paris. Duplicates of the International Standard were maintained in the standards laboratories of other countries of the world. From time to time it was necessary to return these duplicates to Paris for recalibration, and occasionally discrepant results were obtained in these recalibrations. Also, there was doubt in the minds of some scientists regarding the stability of the International Meter Bar. The new definition of the meter relates it to a constant of nature, the wavelength of a specified kind of light, which is believed to be immutable and can be reproduced with great accuracy in any well-equipped laboratory. Thus it is no longer necessary to return the national standards of length to Paris at periodic intervals in order to keep length measurements on a uniform basis throughout the world. Also it is possible to measure some dimensions more accurately in terms of the new definition than was possible before. The meter bars which have served as standards of length throughout the world for over 70 years will not be discarded or placed in museums because of this decision. They will remain important because of the ease with which they can be used for certain types of measurement.

The new definition of the meter will not materially change the measurement of length nor in any way the relation between the English and metric units. Careful experiments performed at the National Bureau of Standards prior to the meeting of the Conference confirmed that the wavelength standard and the metal standard are in satisfactory agreement. The inch now becomes equal to 41,929.399 wavelengths of the krypton light.

Similar measurements performed by the National Research Council in Canada are in substantial agreement with the results obtained at the National Bureau of Standards. They all show that the distance from a point in New York to a point in Washington would be altered by less than three inches, as measured in terms of the old metal standard and the new wavelength standard. However, by adoption of the new definition, the standard of length which has been used by spectroscopists for the past 50 years is brought into agreement with that used in other branches of science, thus increasing the unification of systems of measurement throughout the scientific world. Although the conferees recognized that the new definition may have the effect of shortening the meter, the amount of shortening will be less than 1/5000th part of the thickness of a thin dime.

The Conference also confirmed the action of the International Committee on Weights and Measures in defining the second of time as 1/31,556,925.9747 of the tropical year 1900 instead of 1/86,400 part of the mean solar day, and discussed the possibility of using atomic vibrations as standards for measuring time intervals.

Photographic Copy of Plat of Original Survey Donated to East Liverpool Historical Society [1]

As a result of interest generated by the "Point of Beginning" Commemoration[2] at East Liverpool, Ohio, September 30, 1960, Donald B. Clement, one of the speakers at the dedication ceremonies, has donated to the East Liverpool Historical Society a photographic copy of the plat of the original survey based on the "point of beginning" of the public land surveys in the United States.

[1] Based on information contained in the October 12, 1960, issue of the *East Liverpool Review*, East Liverpool, Ohio.

[2] *See* SURVEYING AND MAPPING, December 1960, Vol. XX, No. 4, pages 475-482.

Is Sea Level Falling or the Land Rising in S. E. Alaska?

By REAR ADMIRAL CHARLES PIERCE

ASSISTANT DIRECTOR, COAST AND GEODETIC SURVEY

SOUTHEAST ALASKA consists of a relatively narrow strip of mainland together with a vast chain of adjacent islands, known as the Alexander Archipelago, which extend in a general northwest and southeast direction between latitudes 55° N and 60° N. The topography is strikingly picturesque with deep and narrow gorges; precipitous cliffs, steep mountains rising directly from the sea; and shores interspersed by numerous waterways and fiords. Through these inner channels runs the "Inside Passage," the sheltered route which extends from Puget Sound to Skagway. In the northern part of the region there are glaciers which are notable for their number and size.

For some years we have recognized that changes have been taking place in this picturesque area. Evidence from observations at our tide stations maintained at Skagway and Juneau together with reports of marked changes in the elevations of tidal bench marks in other parts of the area led to a decision by the Coast and Geodetic Survey to initiate a special tidal survey in 1959 to provide present day values of tidal datum planes. Because of the extensive area involved, the project was divided into two parts. Approximately half of the survey covering the general vicinity of Icy Strait-Lynn Canal, has been completed. The remaining half, extending southward to the Frederick Sound area, will be undertaken during the 1960 season.

PLACE NAMES

Perhaps we might digress a little at this point to refresh our memories on the history of some of the place names in the area.

Presented at the 20th Annual Meeting of the American Congress on Surveying and Mapping, Washington, D. C., March 21–23, 1960.

Juneau: Two early prospectors named Juneau and Harris discovered gold in the vicinity in 1880, leading to the first Alaskan gold rush. There was early rivalry between the names Juneau and Harrisburg for the name of the camp, and U. S. Naval officers also called it Camp Rockwell in 1880 for Commander Charles H. Rockwell. A local election resulted in the choice of Juneau and a post office of that name was established in April 1881. Juneau was officially made the capital in 1900, but the territorial executive offices did not move there from Sitka until 1906.

Taku Inlet & Taku Glacier: The native name for the glacier prevailed after it was named Schulze Glacier in 1883, for Paul Schulze, president of the Northwest Trading Company, and Foster Glacier in 1890 for Charles Foster, then Secretary of the Treasury. There are several other geographic features bearing the name Taku.

Lynn Canal: Lynn Canal extends from the junction of Chatham Strait and Icy Strait for some 80 miles northerly to its head at Skagway, a deep narrow fiord. It was explored by Vancouver in 1794 and named for the place of his birth in England.

Skagway: While still important as the terminus of the White Pass and Yukon Railway, and of a pipeline to Canadian territory, Skagway enjoyed its greatest importance at the time of the Klondike gold rush. At its height the population of Skagway and nearby Dyea was from 10,000 to 20,000. Prior to the completion of the railway in July 1900, extreme hardships were encountered and had to be overcome by all bound for the Klondike and Yukon gold fields. In 1898 alone 25,000 persons are said to have crossed White Pass (2890 ft.) and Chilkoot Pass (3500 ft.).

Skagway was variously spelled before the present form of the name became well estab-

lished. The native word from which it was derived is said to mean "home of the north wind."

Haines: This has always been the second important settlement on Lynn Canal. It was the site of an early Indian village, at which a trading post and Presbyterian mission had been established by 1881. Post Office opened in 1884. It is connected by highway with the Alaska Highway at Haines Junction in Yukon Territory, Canada.

Davidson Glacier: Located on the west shore of Lynn Canal opposite Seduction Point, this glacier was named in the late 1860's for George Davidson who for more than 40 years was with the Coast and Geodetic Survey and subsequently was prominent in scientific circles in California until his death in 1910. The highest elevation in the city of San Francisco is named Mt. Davidson in his honor.

Cross Sound: Named by Sir Francis Drake on May 3, 1778, a day designated on his calendar as Holy Cross Day. In earlier years it was confused with Icy Strait, a name of Russian origin. Present usage is to apply Icy Strait to the eastward and Cross Sound to the westward.

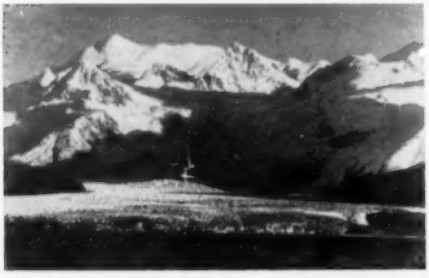


FIGURE 1.—Crillon Glacier located north of Cross Sound and west of Glacier Bay.

Glacier Bay: General area explored by Vancouver in 1794 and also by early Russians. Named Glacier Bay in 1880 by Commander (later Rear Admiral) L. A. Beardsley, USN. John Muir was there in 1879 and 1880. Professor Harry Fielding Reid of Johns Hopkins made extensive explorations in 1890 and 1892 (his report published in Vol. IV of the National Geographic Magazine, 1892 pp. 19–84). The Geological Survey 16th Annual Report for 1896, Part I, pp. 415–461, also provides much information about the glaciers in the bay as they existed up to a very severe earthquake in the adjacent Yakutat Bay area in 1899. Prior to that date the bay was frequently visited by excursion vessels but following the earthquake the bay was clogged by ice for many years. Glacier Bay National Monument, now containing almost 3600 square miles, was first established in 1925. The Monument contains over 20 tremendous glaciers and many others almost equally impressive. They illustrate all stages from actively moving ice masses to those that are nearly stagnant and slowly dying.

Muir Inlet & Muir Glacier: Named for John Muir about 1880. The remarkable recession of Muir Glacier and the consequent lengthening of Muir Inlet is noteworthy. Between Muir's first visit in 1879 and Reid's first visit in 1890 the glacier had receded more than 2 miles. Due to normal recession and the effects of the 1899 earthquake, on the 1952 revision of nautical chart 8306 the north end of the inlet is now some 15 miles north of the southern end of the glacier as reported by Muir in 1879. The other major glaciers in the bay have all had some recession, and many of the smaller ones have disappeared. It is now possible to reach Grand Pacific Glacier through Tarr Inlet, a short distance inside Canada.

It is interesting to note how the names of the geographic features in this extensive waterway of S. E. Alaska reflect the early explorations of many nations, e.g.: Port Alexander, Baranof Island, Cape Chivikof, Arguello Island, Boca de Quadra, Delgada Pt., Beauchamp Island, Gastineau Channel, La Perouse Glacier, Monte Carlo Island, Byron Bay, Dickens Pt., Pitt Island, Napier Pt., and of course the Indian names such as Chilkat Inlet, Hoonah, Metlakatla, and Skookum Chuck.

TIDAL SURVEY

The location and extent of the tidal project is shown in Figure 2.

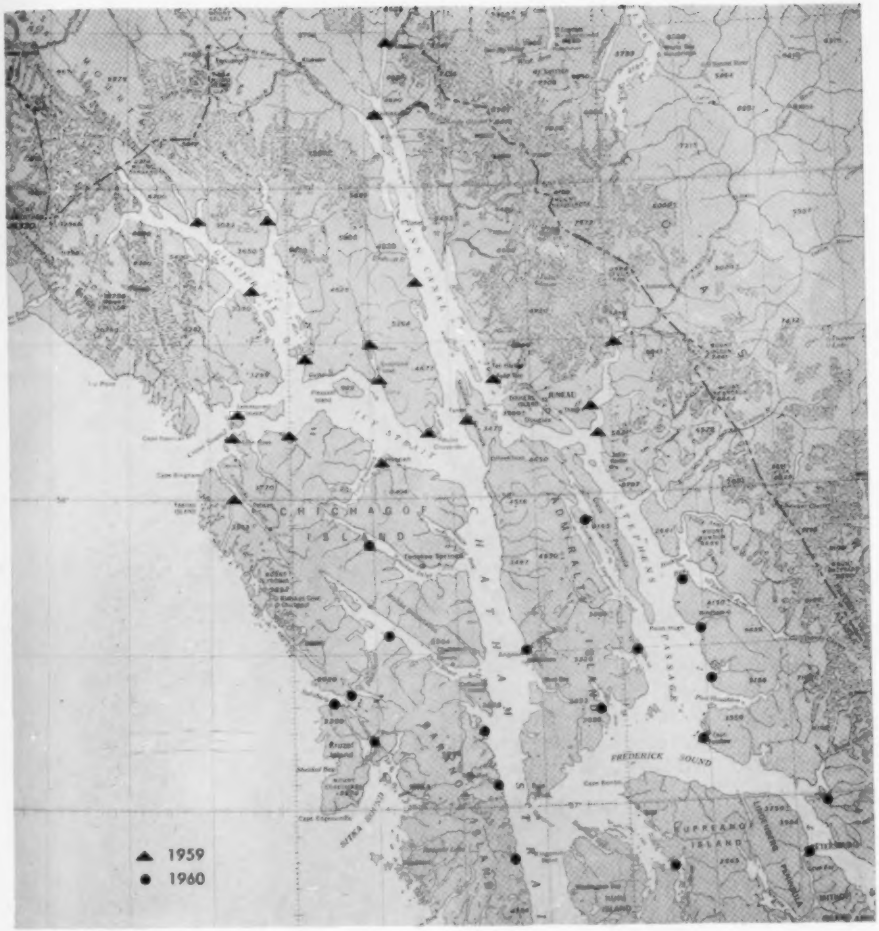


FIGURE 2.—Location of stations in special tidal survey.

During the 1959 operations 20 portable tide-gage stations were established. With one exception, stations were selected at places where tidal bench marks had been previously established so that relative changes in elevation could be determined. One new site for tide observations was selected on Composite Island in the northwest arm of Glacier Bay to provide additional information for this active area in future years. The tide-gage structures varied considerably from place to place, being built to meet the conditions encountered. The first ten gages were installed as rapidly as possible. Additional structures in the second set of ten were erected and levels run between bench marks as time from tending the initial ten gages permitted. As soon as a 60-day series was completed, the gage was shifted to a new tide well. Observations commenced as soon as the tide staff was leveled to the marks. The tide gages were serviced by both air and water transportation, air travel being used as an expedient only when weather conditions were favorable.

FIGURE 3.—Tide station at Haines, Lynn Canal. Gage is on top of pipe in foreground.

Records from the stations were analyzed to determine the various tidal characteristics, mean values being obtained through simultaneous comparisons with results for the control tide station at Ketchikan. The primary objective, however, was the derivation of data for use in computing changes in elevations. The datum derived for this purpose was half-tide level as the old elevations were referred to that datum. Half-tide level, also called mean tide level, is a plane midway between mean high water and mean low water. Normally, the mean sea level datum is used but equally satisfactory results may be obtained through comparisons of half-tide levels. Based on data from our tide stations at Skagway and Juneau, which have been in operation for a period of 15 to 20 years, mean sea level is one-tenth of a foot above half-tide level and the two datums are subject to the same variations. A change in elevation between half-tide level of different tidal series in this area consequently is a measure of change in sea level.

FIGURE 4.—Tide gage installation, Greely Point, Taku Inlet. Guy wires and bracing hold float well in place.

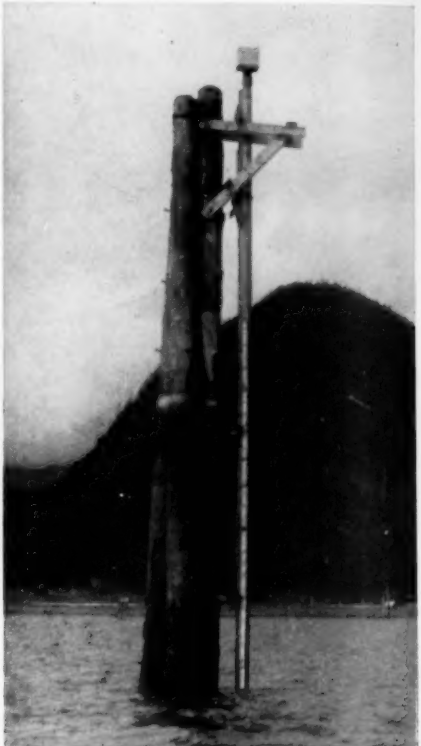


FIGURE 5.—Taku Harbor tide gage installation. Wherever possible advantage was taken of existing structures.

RELATIVE CHANGES IN ELEVATION

The changes in elevation that have taken place at the various stations are shown in Table 1. The figures in the column under Period show the respective years at each station during which determinations of half-tide level were obtained. There are in-

TABLE 1.

CHANGES IN LAND ELEVATION EVIDENCED BY PLANE OF HALF-TIDE LEVEL.

Place	*Period*	*Years*	*Change* (feet)	*Rate of Change* (feet/year)
LYNN CANAL				
Skagway	1909–59	50	+ 2.94	+ 0.06
Haines	1922–59	37	+ 2.73	+ 0.07
Wm. Henry Bay	1922–59	37	+ 2.74	+ 0.07
GLACIER BAY				
Muir Inlet	1940–59	19	+ 2.18	+ 0.11
Willoughby I.	1939–59	20	+ 1.75	+ 0.09
Bartlett Cove	1938–59	21	+ 2.73	+ 0.13
NORTH INIAN PASS				
Inian Cove	1902–59	57	+ 4.33	+ 0.08
CROSS SOUND-ICY STRAIT				
Lisianski Inlet	1917–59	42	+ 1.90	+ 0.05
Elfin Cove	1938–59	21	+ 1.34	+ 0.06
Hoonah	1923–59	36	+ 1.87	+ 0.05
Swanson Harbor	1901–59	58	+ 3.25	+ 0.06
Funter Bay	1922–59	37	+ 1.71	+ 0.05
Auke Bay	1937–59	22	+ 1.39	+ 0.06
Juneau	1911–59	48	+ 2.05	+ 0.04
Annex Creek	1937–59	22	+ 1.02	+ 0.05
Greely Point	1937–59	22	+ 1.01	+ 0.05

stances where more striking changes would be indicated if results from earlier series were used. Due to the very short period of these earlier tide observations, however, the derivation of the datum plane was not considered satisfactory.

Selecting places where the period between the determination of half-tide level approximates half a century, we obtain the following results:

	Change in Years (feet)	
SKAGWAY, at head of Lynn Canal	3	50
JUNEAU, Gastineau Channel	2	48
SWANSON HARBOR, Icy Strait	3	58
INIAN COVE, North Inian Pass	4½	57

To obtain comparable values for the various stations in the project, where the period of years between datum determinations varies considerably, we have computed the rate of change per year for each station. With this we find that fairly consistent rate-of-change values can be obtained for separate areas. The largest changes have occurred north of Icy Strait. Along the shores of Glacier Bay the tide records indicate an average change of about 0.11 foot per year. The effect of the large changes in Glacier Bay appears to extend to the Inian Islands where the records show a slightly diminished rate of about 0.08 foot per year. To the eastward, in Lynn Canal, the change has been at the average rate of about 0.07 foot per year. For the whole area north of Icy Strait we thus obtain an average change at the rate of 0.09 foot per year. Southward, along the shores of Cross Sound and Icy Strait and the waterways in the general vicinity of Juneau the indicated change is smaller, being of the order of 0.05 foot per year.

As measured by the relation of half-tide level to bench marks, these changes would

appear to indicate that sea level has been falling. Such changes, however, are relative because in a particular area a change in elevation as referred to local sea level could represent an actual lowering of the sea or land uplift. Studies of sea level along the coasts of the United States and other countries throughout the world provide evidence of a slow general rise in the level of the oceans during the past 50 years or more. It is our conclusion, therefore, that sea level could not be falling in the limited area under discussion while it is rising in the great oceanic basins. The movement in the Icy Strait-Lynn Canal area of Southeast Alaska, consequently, represents land emergence rather than falling sea level. This land uplift is attributed to the release of ice load by the melting of the numerous glaciers in the area. This hypothesis is supported by a report of IGY studies of glacial changes in Southeast Alaska in which Goldwait[1] brings out the fact that most of the glaciers have receded markedly for the last century. Also, investigations carried out in the Scandinavian countries have disclosed similar land uplift.

The changes in bench mark elevations disclosed by the tidal survey are only part of the over-all picture for hydrography is also affected. Lieutenant Commander E. W. Richards, who was in charge of the tidal survey, also directed some special hydrographic investigations and reported that many critical depths in the area have shoaled about one-half to one fathom since the original survey. Rocks that were previously charted as covered at all stages of the tide have in recent years been observed by local inhabitants as baring at low water. To the members of this Congress such extensive land movement has special signifcance for in it we see additional problems that must be taken into consideration in adequately surveying and mapping the extensive areas of the new State of Alaska.

[1] Post-Wisconsin Glacial Changes in Southeast Alaska. Richard P. Goldwait. Bulletin of the Geological Society of America, V. 70, No. 12, Part 2. Abstracts and Index (July–December 1959).

Tribute Paid T.V.A. Surveyors and Mappers at Awarding of 25-Year Service Pins

At the recognition dinner in Chattanooga, Tenn., on January 20, 1961, fifteen members of TVA's Maps and Surveys Branch were presented gold pins for 25 years of service.

Addressing those assembled for the occasion, Brooks Hays, then a member of the TVA Board of Directors and more recently appointed by United States President Kennedy as Undersecretary of State for Congressional Relations, said that the TVA, which has been called by Adlai Stevenson "a pilot project," has "attracted the attention of the world."

The Maps and Surveys Branch of the TVA was lauded for its quarter of a century contribution to modern cartography which has been a basic essential for the comprehensive intelligence so necessary for intelligent engineering in both peace and war.

Those receiving the 25-year pins were:* W. Leon Arnold, George F. Beckert, J. Wesley Campbell, *Russell S. Dittmer, Walter S. Dix,* James H. Fletcher, Jones E. Hamilton, *Benjamin O. Holmes, William S. Massa, William P. Miles,* Archie A. Miller, T. Grady Mullenix, Z. Alton Newby, George E. Schmidt, and Kenneth P. White.

The presentation was made by *Paul Morris,* Chief of the TVA's Maps and Survey Branch.

Other participating were Reed A. Elliot,[1] Chief Engineer, and *Robert E. Frierson,*[2] Assistant Chief Engineer of TVA's Water Control Planning.

Robert V. Curtis presided over the event.

* Those whose names are printed in italics are members of the ACSM.

[1] Author of "Value of Topographic Maps to the Tennessee Valley Authority Program." *See* SURVEYING AND MAPPING, January–March 1950, Vol. X, No. 1, page 3.

[2] Former Chief of TVA's Maps and Surveys Branch; former member of ACSM's Publications Committee; and contributor to SURVEYING AND MAPPING.

Augustine Herrman's Map of Virginia and Maryland, 1673, Acquired by the Library of Congress*

By WALTER W. RISTOW

LIBRARY OF CONGRESS

NO MATTER how rich and comprehensive may be its collections, it is a rare library which does not lack significant historical documents. Decades and even generations may sometimes pass before certain elusive items are acquired. High on the desiderata list of the Map Division, since its establishment in 1897, has been Augustine Herrman's rare map of *Virginia and Maryland,* published in 1673. Less than a century ago the Herrman map was virtually unknown in this country, even among scholars. Not until 1929 was an original copy of the map acquired by an American Library.

Proudly reporting its accession by the John Carter Brown Library in that year, Dr. Lawrence Wroth described the Herrman map as "of such rarity as to be almost the subject of legend."[1] He further observed that "with the notable exception of the fundamental John Smith Map of Virginia of 1612, it is the most distinguished map of the early colonial period of English America."

Such a noteworthy historic document, obviously, should be in the collections of the Library of Congress. It is with a real sense of satisfaction and gratitude, therefore, that we report the acquisition of this outstanding cartographic and historic treasure.

Herrman's map, which bears the lengthy title "Virginia and Maryland As it is Planted and Inhabited this year 1670 Surveyed and Exactly Drawn by the Only Labour & Endeavor of Augustin Herrman, Bohemiensis," extends along the Atlantic coast from Barnegat, on the Jersey shore, southward beyond Cape Henry in Virginia. Portions of Carolina, New Jersey, and Pennsylvania, as well as Virginia, Maryland, and present Delaware are included within the map limits.

The long-sought map was acquired through the generosity of Arthur A. Houghton, Jr., of New York City, long a friend and benefactor of the Library of Congress, and with the much appreciated cooperation of the Bibliothèque Nationale of Paris. Some months ago members of the Map Division staff learned that France's national library possessed two copies of the rare Herrman map. A letter promptly went off to the Bibliothèque's Curator of Maps and Charts inquiring whether an exchange or purchase might be negotiated for one copy. The reply was disappointing. Both copies, unfortunately, were in special collections which could not be violated.

Hope was revived several months later when the Bibliothèque Nationale reported finding in its collections a third copy of the Virginia and Maryland Map. Officials of that institution would, moreover, consider making this copy available to the Library of Congress on an exchange basis. Following further correspondence, agreement was reached whereby the Library of Congress would purchase from a French dealer, at a specified price, a map desired by the Bibliothèque Nationale. The selected item, a fifteenth century manuscript chart of the Mediterranean region, would be accepted in exchange for the Herrman map.

But a new road block was now encountered. All the Library's purchase funds for the year were already allocated. Would plans for acquiring the rare historic map for the nation's library have to be abandoned?

* Reprinted, with permission, from *The Library of Congress Quarterly Journal of Current Acquisitions,* August, 1960.

[1] *In* John Carter Brown Library, Annual Report, 1929–30. Providence, 1930.

Fortunately, the Library has a generous and public-spirited friend to whom it could turn in its hour of need. Mr. Houghton was approached, and he readily offered to provide the funds for completing the transaction with the Bibliothèque Nationale. Thanks to his liberal gift, prompted by a longtime and acitve interest in enriching the collections of the national library, one of the truly noteworthy maps of seventeenth century colonial America is now in the Library of Congress. Here it adds further luster and distinction to the Map Division's storehouse of cartographic and historic rarities and is available for examination and study by the nation's scholars.

Augustine Herrman, author of the map of *Virginia and Maryland,* is one of the most lusty and colorful personalities of seventeenth century colonial America. In addition to surveying and mapping, he was occupied, at various times, in industry, engineering, fur trading, privateering, land speculation, commercial enterprises, slave trading, public administration, diplomacy, law, finance, and farming.

Concerning Herrman's early years in his native Europe, we have only meager information. He was born in Prague, Bohemia, probably in 1605, of well-situated parents. Augustine seemingly had his early education in Prague where he studied geology, surveying, languages, and classical literature. The elder Herrman was a follower of the pioneer Protestant Reformer Jan Hus, and with the return to power of the anti-Hussite forces, the Herrman family fled Bohemia, about 1618. They went first to Germany, then settled in Amsterdam, where Augustine probably continued his studies.

Some accounts indicate that young Herrman spent several years in the army, serving under the Protestant hero, Gustavus Adolphus, around 1628. If this is true, he may have acquired engineering and surveying experience while in military service.

By the third decade of the seventeenth century, Amsterdam had become a leading center of commerce and trade. Almost daily, ships entered the port with cargo from remote and fascinating parts of the world. The large trading companies sought bright young men to serve as their foreign agents, and Herrman was among those engaged by the Dutch West India Company.

When the young adventurer first went to America we do not know. There is record of his presence at the site of Philadelphia in 1633 when those lands were purchased from the Indians. During the next ten or twelve years Herrman undoubtedly carried on trading activities in various parts of the West Indies and the North American colonies. In later years, he was to boast of having been the "beginner of the tobacco trade in Virginia."

By 1644, and perhaps earlier, Herrman was an agent in New Amsterdam for the Dutch trading firm of Peter Gabry and Sons. Shortly after, he established his own trading company, and also engaged in farming, fur trading, and land speculation. Herrman, by the middle fifties, was one of the leading merchants and citizens of New Amsterdam, and a close, though not always friendly, associate of Governor Peter Stuyvesant. The latter, however, found it expedient to utilize Herrman's talents and experience on several missions involving relations and differences with neighboring colonies. One such assignment resulted in the map of *Virginia and Maryland.*

In 1655 the Dutch in America extended their possessions to the south, by taking over the Swedish settlement on Delaware Bay. This accession of territory, however, opened up new problems, for it placed the Dutch in contact with the British lands of Lord Baltimore. Because of the vague and uncertain limits of the original grants it was inevitable that jurisdictional differences would develop.

Governor Josiah Fendall of Maryland, noting the increasing Dutch colonization on the Delaware, dispatched a military expedition, in 1659, to inform the settlers that they were encroaching upon British territory. This in turn incensed the Dutch Governor Peter Stuyvesant, who appointed as special ambassadors, Augustine Herrman and Resolved Waldron, to discuss the matter with the Maryland Governor. Herrman ably presented the Dutch claims, but no definite agreement was reached regarding the dis-

puted territory. The report on the conference was carried back to New Amsterdam by Waldron, while Herrman repaired to Virginia to spend the winter with relatives and to negotiate trade treaties between that colony and New Netherlands.

Herrman's travels through Maryland, for the meeting with Governor Fendall, and his experiences at the conference, impressed upon him the need for a good map of the region. Consequently, in October 1659, he wrote Governor Stuyvesant: "But first of all, the South River (Delaware) and the Virginias, with the lands and kills between both, ought to be laid down on an exact scale as to longitude and latitude, in a perfect map, that the extent of country on both sides may be correctly seen, and the work afterwards proceeded with, for some maps which the English have here are utterly imperfect and prejudicial to us. The sooner this is done the better, before Baltamoor whispers in the ears of the States of England, and thus make the matter much more difficult."[2]

Herrman obviously enjoyed his winter in Virginia and Maryland, and decided to settle permanently in this region. Whether or not Stuyvesant's lack of interest in the proposal to make a map had any influence on his decision we do not know. Among other factors, he may also have foreseen the end of Dutch rule in New Amsterdam and decided to cast his lot with the British. Undoubtedly, too, he was impressed with the beauty of Maryland and of its great expanses of unsettled land, and fancied the more gracious social life in the southern colonies.

Whatever his reasons, some time in late 1659 Herrman made application to become a "denizen," of the territory of Maryland, in order to be able to hold property. On January 14, 1660, the denizenation order was signed by Lord Baltimore. Prior to this date Herrman had approached the Maryland proprietary with reference to mapping the territory, and apparently had even displayed a preliminary manuscript map to Baltimore. The act, conferring denizen, or resident, rights on Herrman states that inasmuch as the latter "for our satisfaction and the bennefitt of trade hath drawne a Mapp of all the Rivers Creekes and Harbours thereunto belonging know yee that Wee willing to give due encouradgement to men of his profession . . . hereby Declare him the said Augustine Herman to be a free Denizen of this our Province of Maryland."[3]

In August 1661 Herrman received from Lord Baltimore the first of several extensive grants of land, which subsequently totaled between twenty and twenty-five thousand acres. Bohemia Manor, named for Herrman's native land, and where he established his manorial residence, included some 6,000 acres, located on both sides of the Elk River, in present Cecil County. It was first surveyed in August 1661 and granted to Herrman, by patent of June 19, 1662, "for making the Mapp of this province."[4]

Sometime in 1661 or 1662 Herrman transferred his family and servants from New Amsterdam to Bohemia Manor. He and his wife, the former Janneken Verlett of New Amsterdam, whom he married in 1651, had two sons and three daughters. Janneken apparently died shortly after the family moved to Maryland, for only the names of Herrman and his five children appear on the "Acte of Naturalization" papers which were submitted in 1663.[5]

Herrman conducted surveys and worked on his map for more than a decade, from 1659 to 1670. Preliminary surveys were made on his embassy journey in 1659, and during that winter he undoubtedly did some mapping in Virginia. The map shows the greatest detail along the borders of Chesapeake Bay, and Herrman probably personally explored and surveyed this area. In addition to his own explorations, he undoubtedly consulted various printed and manuscript maps, including that prepared by Captain John Smith in 1612.

[2] Maryland Archives, Vol. 3, (Proceedings of Council), p. 398.

[3] Ibid. v. 1, p. 398–399.

[4] Owings, Donnell M., Private manors: an edited list. *In* Maryland Historical Magazine, v. 33, Dec. 1938, p. 332.

[5] Maryland Archives, v. 1, p. 462.

The decade between 1660 and 1670 was a busy one for Herrman, and surveying had often to be halted for other pressing tasks. There was a manor house and buildings to be constructed, land to be cleared, and new settlers located. For the first several years of the period Herrman still maintained interests and property in New Amsterdam, and also carried on some trading activities there as well as in Maryland. The death of Herrman's wife and his remarriage in 1666, also delayed completion of the map. Moreover, he was not long resident in his new home before he was heavily involved in administrative and magisterial responsibilities.

Consequently, it was 1670 before surveys were completed, and during the next several years Herrman was occupied in plotting, drafting, and ornamenting the map. The finished manuscript was sent to London, where it was engraved, in 1673, by William Faithorne. It is suggested by some authorities that the engraver may have been recommended by Herrman's fellow Bohemian, and probable boyhood companion, the artist Wenceslaus Hollar. The latter, it is noted, resided in the same London house as Faithorne some years earlier. Hermann was not pleased with the engraved map and is said to have remarked that it "was slobbered over by the engraver Faithorne defiling the prints by many errors."

Although no publisher's name appears on the map, it was published and sold by John Seller, well-known London map printer of the period. A notice in the *London Gazette* for 1674 (no. 873) states that "there is now Extant a new Map of Virginia and Maryland in four Sheets, describing the Countries, and the scituation of the Plantations in the said Countreys, with the Rivers, Creeks, Bayes, Roads and Harbors on the Sea-Coasts. Published by His Majesties especial Licence, and are sold by John Seller, Hydrographer to the King."[6] On the John Carter Brown Library copy of the Herrman map, (the only other known copy in this country) there is a pasted slip which bears the imprint: "Sold by John Seller, Hydrographer to the King at his shop in Exchange ally in Cornhill, London."

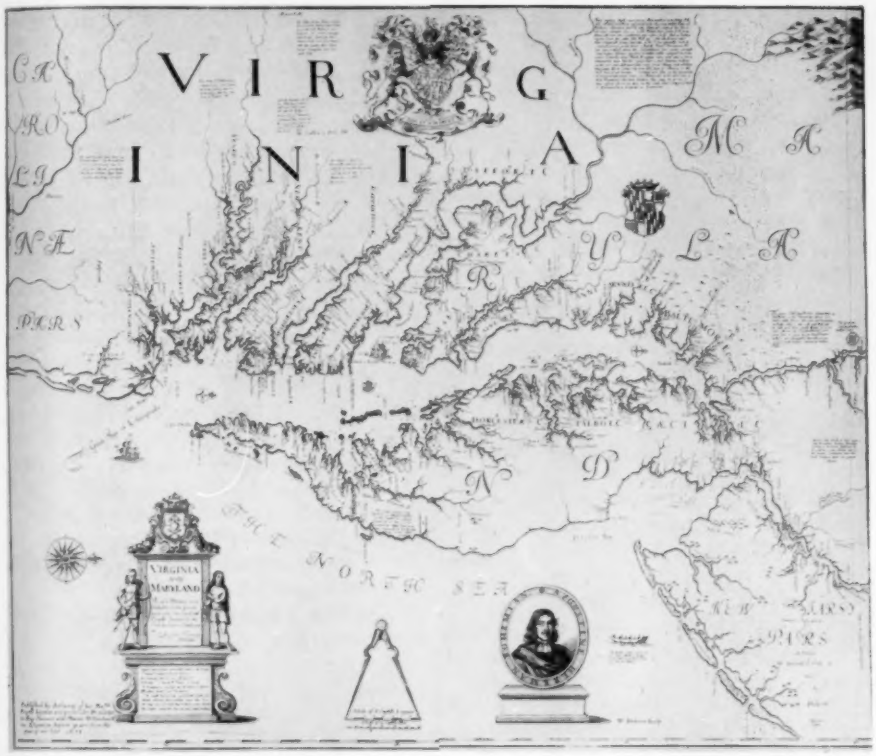
The map of *Virginia and Maryland* is on four sheets which, if joined, measure 31 x 37¼ inches. The two top sheets are 15⅜ by 18⅝ inches, while the bottom sheets measure 15⅜ by 18⅝ inches. The Herrman map, like that prepared by John Smith in 1612, is oriented with the west at the top. Chesapeake Bay, with its numerous embayments and tributary streams, occupies the central portion of the map. Settlements, plantations, and Indian villages are named along the shores, and soundings are given for many of the bays and harbors. On the northwestern (i.e. top right) sheet hills and mountains are indicated by pictorial hill symbols and hachuring.

Notwithstanding Herrman's personal disappointment with Faithorne's craftsmanship, the map is an outstanding example of seventeenth century drafting and engraving. The lengthy title and inscription are set in an ornate plate on the lower left sheet. The bottom of the plate is a pedestal flanked on either side by an acanthus, and faced with the legend or list of symbols used on the map. Standing on the pedestal, with the title inscription between them, are figures of an Indian boy and girl. An ornamental shield, surmounted by a Neptune head, and trailing clusters of leaves and fruit, decorates the top of the plate.

Other embellishments include the British royal arms, the shield of Lord Baltimore, a mariner's compass, a mason's compass, an Indian canoe, several sailing vessels, and a bust of Herrman. The latter, very likely a self-portrait, is set in an oval frame within which is lettered "Augustine Herrman Bohemian." It is interesting to note that two different spellings of both the cartographer's surname and given name are found on the map. There are actually some dozen or more variations of Herrman's name in different documents and reports. The form "Herrman" is most commonly accepted today.

Herrman apparently did not survey the area comprising the western part of the

[6] *Quoted in* P. Lee Phillips', The rare Map of Virginia and Maryland by Augustine Herrman, 1911, p. 9.



Augustine Herrman's Map of Virginia and Maryland, 1673. The four sheets of the original were joined, for purposes of this reproduction, to form a contiguous map.

map. Printed descriptions give information (some of it legendary) about these regions and also serve to fill in the blank portions of the map. Thus, on the southwest sheet we are informed that "The Land between James River and Roanoke River is for the most parts Low Suncken Swampy Land not well passable but with great dificulty. And therein harbours Tygers Bears and other Devouringe Creatures."

Although the 1673 map was apparently Herrman's only cartographic work, he is credited with having drawn the earliest view of New Amsterdam. This first appeared on Nicholas Van Visscher's map of New Netherland (1650), and later (1655) illustrated Adriaen Van der Donck's "Description of the New Netherlands." Some Herrman biographers believe it likely that he may have helped Visscher in preparing the above named map.

The Herrman map ranks with that of John Smith (1612) as one of the major cartographic publications of seventeenth century America. Mathews has noted that, "when compared with its predecessors Herrman's map shows a marked increase in detail and evidence of much greater time and labor spent in its preparation. Compared with the Smith map it shows that while Herrman was a more skillful draftsman and a better surveyor, he did not possess the geographic sense shown by Smith."[7]

Mathews believed that the "influence of Herrman on later works seems to have been about equal to that of Smith, since in the

[7] Mathews, E. B. Maps and map-makers of Maryland, Baltimore, 1898, p. 385–386.

minds of the prominent map and atlas publishers of the last of the seventeenth and the first of the eighteenth centuries, these two men stand as the chief authorities for the cartographic representation of the territory on each side of the Chesapeake Bay."[8]

The map of *Virginia and Maryland* was copied and adapted by map makers for more than a century after its publication. It was especially important in helping to solve the boundary differences between Maryland, Virginia, and Pennsylvania. "Indeed," says Wroth, "the usefulness of the map has been extraordinary from the earliest days, for in the ninety years of Privy Council and Chancery proceedings that resulted in the running of the Mason and Dixon line between Maryland and Pennsylvania in 1763, the Herrman map was always looked upon as an important exhibit between the Baltimores and the Penns."[9] Wroth notes that "it is an ironical reflection that, in spite of Lord Baltimore's pleasure and satisfaction in this delineation of his province, the Herrman map should have been used successfully against the interests of his colony, and of the State of Maryland, in every boundary dispute from the day of its construction to the present generation."[10]

[8] Ibid. p. 386.

[9] Wroth, Lawrence C. *In* John Carter Brown Library, Annual Report, 1929–30. Providence, 1930. p. 10.

The Library of Congress acquisition increases to five the number of known copies of Augustine Herrman's map. In addition to that in the John Carter Brown Library, there are three copies in Europe, one in the British Museum, and two in the Bibliothèque Nationale of Paris. In the latter library one copy is in the collection of d'Anville, and the other in the collection of the Service Hydrographique de la Marine.

Through the years a number of facsimiles and reproductions have been made of the map. P. Lee Phillips, first Chief of the Map Division, published a monograph, in 1911, entitled "The rare map of Virginia and Maryland by Augustine Herrman, a bibliographical account with facsimile reproduction from the copy in the British Museum," Washington, Lowdermilk. Still available is a facsimile, published in 1941, by the John Carter Brown Library, Providence, Rhode Island, of the copy in its collections.

The Map Division copy is in an excellent state of preservation. Each of the four sheets had been folded in half, apparently for some time, and there are several worm holes along the folds. For permanent preservation the map has been laminated, with cloth backing, retaining the four sheet format.

[10] Ibid., p. 13.

Philippine Bureau of Lands Adopts Photogrammetry for Lot Surveys

On June 20, 1958, the Bureau of Lands of the Philippines inaugurated its first cadastral survey by photogrammetry covering four municipalities in the central part of Bulacan province. The monumenting of lot corners and photography have recently been accomplished. The work is now in the processing and computation stage. Meanwhile, the aerial survey has been extended this year to other municipalities in the province not previously covered by ground survey methods.

It is expected by the Bureau that the unsurveyed portion of the country can be airsurveyed within 15 years. Presently the Bureau of Lands has set up ₱272,000 worth of photogrammetric equipment, and it has rented IBM machines for processing and computation purposes. The Lands Office uses a microfilming machine which can record 400,000 plans and survey records a day. Assistant Director Nicanor G. Jorge, who is in charge of the project, said that photogrammetric methods will reduce considerably the man-hours and costs normally incurred by ground methods.

—Norberto S. Vila
Secretary, PSGE

The Professional Status of Land Surveyors

By CURTIS M. BROWN*

AT THE present time the professional status of the land surveyor is the subject of national discussion. Within the next few years the surveyor will be in one of two positions. First, he can have subprofessional standing with low educational requirements and minor areas of practice, or, second, he can bring himself up to the standards of the better professions and assert himself in a larger area of practice. The surveyor cannot afford to stand still. The engineers, land planners and the like are advancing their stature at a rapid pace and if they pass the surveyor too far they will supplant him.

All of you are no doubt acquainted with the fact that the original unadopted report of the American Society of Civil Engineers task committee excluded surveying as a part of civil engineering. The later report, as adopted, included land surveying as a branch of civil engineering. At the recent American Congress on Surveying and Mapping meeting the ASCE task committee's report, with some modifications to better suit the land surveyor, was adopted by the ACSM status committee.

At the same time the status committee was having its problems resolved, the National Council of State Boards of Engineering Examiner's special committee was meeting to consider a model law (including educational requirements) for surveyors. This meeting was called to coincide with the ACSM meeting so that the two groups could merge ideas. The talks did bring about a unification of many thoughts.

Before pointing out what areas of agreement were achieved at this meeting, a general discussion of the present status of the land surveyor is advisable.

Attaining Professional Stature.

Professional stature cannot be attained by self proclamation. The lazy say, give me the prize without the training, the wages without work, the reward without the quest, heaven without probation, a profession's prestige without a profession's skill. If the land surveyor is to have professional standing, that standing must be earned—and bestowed upon him by others.

You and I know and believe that land surveying is a profession. But whether it is a profession or not is not our privilege to proclaim; others are the judges. The opinion of learned men and the opinion of the public is the proof.

Fortunately for the world, professional stature is something that must be earned, not merely claimed. If it were otherwise, everyone would soon lay claim to a higher standing, whether qualified or not. Many do attempt to filtch good names. The A.F.L. engine operator (dozer operators and the like) inflate their ego by calling themselves "operating engineers". This of course proves to them that they are engineers, hence, it is their right to organize all surveyors as a part of the operating engineers union. The boy who carries the stake bag, coats, lunches and water is certain of his important position in society if he is called an engineering aid rather than a flunky 3rd grade. Mere claiming a good name is not proof that a person has the right to the name. A person's actions, behavior, and conduct are far more potent proof.

The proof of what we are is not what we claim to be. The proof is what others know

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us to be. We might well ask ourselves, what, on the average, do others think of us?

The professions that you and I and most everyone recognize and acclaim as professions, i.e., the doctors, attorneys, and clergy, need not use the title professional doctor, professional attorney, or professional clergy; everyone considers them professional. The title was bestowed upon them because of their ethics, behavior, and standing in the community. If the land surveyors wish to acquire and maintain a professional reputation, they must earn that right by the average standing of the majority of all land surveyors.

Definition of a Profession.

I have no intention of trying to pinpoint a definition of what constitutes a profession; even the experts have varied opinions. To make matters worse, there are two definitions—one broad and one restricted. Quotations from a few cases at law will help us understand the meaning.

From *State* v. *Cohn* (184 LA 53) is quoted, "Very generally the term 'profession' is employed as referring to a calling in which one professes to have acquired some special knowledge, used by way of instructing, guiding, or advising others or of serving them in some art. Formerly theology, law and medicine were specifically known as 'the professions,' but, as the applications of science and learning are extended to other departments of affairs, other vocations also received the name. The word 'profession' is a practical dealing with affairs as distinguished from mere study or investigation; and an application of such knowledge for others as a vocation, as distinguished from the pursuits for its own purposes."

While research in science is certainly a learned occupation requiring special knowledge, it certainly is not a profession. A profession deals with the affairs of others; it aids others; it does not merely seek knowledge for the sake of gaining knowledge.

From 107 S.W. 555 is quoted, "The word 'profession' in its larger meaning, means occupation, that is, if not industrial, mechanical, agricultural, or the like, to whatever one devotes one self; the business which one professes to understand and follow. In a restricted sense it only applies to the learned professions."

One last quotation is from *Stiner* v. *Yelle* (174 Wash 402) and it apparently refers to the higher type of profession. "A 'Profession' is not a money-getting business. It has no element of commercialism in it. True, the professional man seeks to live by what he earns, but his main purpose and desire is to be of service to those who seek his aid and to the community of which he is a necessary part. In some instances, where the recipient is able to respond, seemingly large fees may be paid, but to others unable to pay adequately, or at all, the professional service is usually cheerfully rendered."

From this, it is obvious that in a broad sense "profession" includes many fields such as college professors, engineers, professional boxers, and surveyors, all with varying degrees of qualifications. In a narrow sense there are only three professions, the learned professions of theology, law, and medicine.

Land surveying to me is a profession; my only question is one of classification of standing. I am not so naive as to believe that we, at the present time and in the opinion of others, are anywhere near equal in stature with the three learned professions, but I do believe that by sustained effort we can achieve a standing comparable to the learned professions.

Attributes of a Profession.

Most surveyors have sufficient ego to want to measure up to the three learned professions rather than to measure down to those of doubtful standing whose only claim to fame may be by self proclamation. If the surveyor is to compare with the learned professions, he must approach the attributes of those professions and some of those attributes are:

1. Superior education in a field of knowledge.
2. Service to the public.
3. The possibility of gaining highest eminence without necessarily earning much money.

4. Providing services to those unable to pay.

5. Independent judgement and liability as a result of that judgement.

6. Ethics.

7. If fees are charged those able to to pay, fees are dependent upon knowledge rather than labor or product.

Without question, superior education in a field of knowledge is an essential feature of a profession, and there is little question but what a *good* professional land surveyor should have superior knowledge in a specialized field. Some individual land surveyors, by self effort or by formal training in colleges, are well educated, but, as compared to the learned professions, are surveyors required to have an equivalent amount of knowledge? How many licensed practicing surveyors have the benefit of a college degree as compared to the doctors, attorneys, and clergy? Proof of the simplicity of our knowledge requirements can be had by looking at the past surveyor examinations administered in many States. In a number of States no registration or examination is needed; in others the examination is so simplified that even the flunky, 3rd grade, could make a good showing. No wonder many look askance at our profession. The standing of all surveyors as a professional group will suffer unless we as a whole raise our requirements. Experience is never a complete substitute for education. It augments education, but can never supplant education. Education, of course, can be attained either formally at college or self taught at home. Whichever way it may be gained, there is no reason for allowing a professional surveyor to be registered without having superior knowledge. Without superior knowledge, we have an inferior profession.

Man's knowledge in itself does not make a profession; man must use knowledge to aid, assist, teach, or benefit others. Application of knowledge to the affairs of others is an essential part of the definition of a profession.

The process of acquiring knowledge and the process of application of knowledge are distinctly different. Parrots can memorize a vocabulary of sorts, but who has ever observed a parrot with the ability to tell another of his needs? The knowledge and experience of a professional man combined with his ability to reason and arrive at a solution to a problem is why others seek his advice. The success or failure of each of us is, in a measure, due to our reasoning ability.

In the learned professions the professional man has a call of duty beyond that of a fee. The doctors are obligated to serve the sick regardless of ability to pay; the clergy do not turn away those in trouble; the attorneys defend the criminal. However, it is noted that the doctors and attorneys do charge a fee and those able to pay, must pay. This is as it ought to be.

The land surveyor does not display this type of obligation. It is doubtful if many surveyors would willingly serve those incapable of paying the required fee. Land surveying is not an urgent necessity; if it is not done today, it can be done tomorrow. If a person cannot pay today, his survey can wait until tomorrow. Attorneys more or less adopt this attitude for services in connection with business matters.

The surveyor does have moral obligations to the public and among them is the duty to never subtract from the rights of adjoiners. Every boundary survey for a client establishes the boundary of an adjoiner. One of the reasons for giving surveyors the exclusive privilege of marking boundaries is to prevent the unskilled from monumenting lines that encroach on the bona fide rights of others. As an obligation to the public the surveyor should not, in any way, assist a client in acquiring rights to land that are not his to enjoy.

Any surveyor can attain eminence without necessarily earning much money. In your own area, what do other surveyors and the public think of you? Do they consider you ethical? Do they seek you out for advice? Have you contributed anything to the surveying profession, or do you just sit back and let others advance the profession? Is earning a dollar by any means more important than maintaining a principle? Will you sell your signature? Do you aid others in evad-

ing the licensing act? Do you degrade your fellow land surveyors? Have you actively pushed the cause of all surveyors or do you selfishly only look out for yourself? Are you active in your professional society? Have you had articles published in a professional surveyors magazine? Do you serve on committees? Or do you just sit back on your prerogatives? One of the first duties of a professional man is to advance his profession. These questions serve to evaluate yourself. It is only by the concerted effort of all, that we as a group will advance to an unquestioned professional stature. In every community we find those that are substandard and those that have attained eminence. Which are you?

Attorneys and doctors charge a fee which is not dependent upon the physical labor or force applied. Personal knowledge gained through education and experience creates the demand for the service rather than the size of the muscle on the arm. Contracting is for businessmen actively competing on the basis of the lowest cost or the lowest bid. The moment services are based upon the lowest price, a profession has reduced itself to a business. Service based upon superior knowledge is the foundation of the fee of a professional. Are you a member of a profession, or are you a businessman? Many individuals in the matter of fees have attained professional standing. From the complaints I have heard in various meetings, I can only assume that, as a group, on the average, surveyors have not attained professional stature in their methods of charging fees.

Money, in itself, does not enter into the definition of a profession, but it does have a profound influence on what others think of a profession. Members of a group that show by their outward appearances that they are not successful in handling their own financial affairs, can hardly instill confidence in the public. A person who uses antiquated equipment and the back room of his house as an office is not likely to contribute to professional standing. Success breeds success. Outward appearances do count. They are a part of the overall picture.

Ethics is that branch of moral science which treats of the duties which a member of a profession owes to the public, to his professional brethren, and to his client. Without ethics land surveying can never be a profession.

Everyone is familiar with the fact that an individual may strictly observe the laws of the land and yet be an undesirable citizen and a poor neighbor. Lord Moulton in an article in the Atlantic Monthly (134 Atlantic Monthly 1, 13, 1924) stated, "The real greatness of a nation, its true civilization, is measured by the extent of Obedience to the Unenforceable". Ethics are often unenforceable. True professional stature arises from obedience to the unenforceable.

Advocating observances of ethics is not sufficient; the surveyor's personal example is far more important. It is not sufficient that the surveyor alone feels that he has honesty and integrity; the public, clients, and fellow practitioners must also believe so. The proof of observance of ethics lies in the opinions of others.

If we as surveyors are to maintain a respected position as professionals in the community, we must look beyond the club of the law to ethical standards which prohibit the doing of that which the law does not forbid.

What Others Think of Us.

What is the present professional status of a particular surveyor or all land surveyors can only be answered by examining what others think of us. And what others think of us varies considerably depending upon which group or individual you ask. The opinion of the courts is distinctly at contrast with the educators. The layman's opinion is different from that of a non-surveyor engineer.

Courts, in response to liability litigation, have taken a positive stand on the status of all land surveyors. In the eyes of the law the land surveyor is treated with professional respect; he has all the liability accorded a professional man. While from the viewpoint of the pocketbook, this privilege of liability does have disadvantages, it is proof, in a backhanded way, that the land surveyor is above the technician level.

The word privilege of liability was used

advisedly. Human nature, being what it is, always offers a temptation to meet competition by doing a poorer job for less money. But professional liability is independent of the fee. A person agreeing to do a poorer job for less money carries identical liability to that of a person doing a better job for more money. This is as it ought to be.

Since we as surveyors are liable, one of the greatest deterrents to substandard work is this liability. While liability to the individual may be considered a disadvantage, it is an advantage to a professon as a whole. Without liability, I fear that those willing to do poorer work for less money would soon ruin the professional standing of all land surveyors. And so I say, professional liability is a privilege tending to prove the land surveyor's professional standing.

The courts say that we as a group are professional men; but this is not prima facie proof that everyone thinks that each of us is, nor is it proof that we are looked upon with equal standing to the learned professions. If we are to enjoy the standing and dignity afforded professional men, others must know and act as if they believe we are professional men. What do educators think?

Without doubt the educators are the most severe critics of our reputation, and their criticism has justifiable merit. As a whole, and without question, we are not nearly as well educated as is required of the learned professions. We are usually the low man on the totem pole with respect to engineering. Engineering professors, with minor exceptions, are more than likely to refer to the surveyor as a "technician" or subprofessional requiring a small amount of specialized education that can be acquired by the apprentice system. As proof of this we need only glance at the college engineering curriculum. Surveying on the average has been reduced to nothing more than a few hours of fragmentary instructions covering limited phases of the work. Every year additional college summer surveying camps are being abandoned. In short, we are being gradually ousted as a part of engineering education.

In the eyes of the average engineer the average land surveyor is not top grade "A" quality, and this is probably the result of educational differences. The Professional Engineers Society, with minor exceptions, do not extend surveyors the privilege of membership. Surveyors are looked upon as second grade citizens and assigned to functional groups. Even the American Society of Civil Engineers displayed considerable doubt, to judge by the first report of its task committee. The second report restored the surveyors to membership possibilities. But in their wording for the requirements to advance to the "fellow" grade, they have excluded the surveyor from the possibility of ever achieving this honor. After questioning many engineers of all classifications on this subject, I would say that on the average, a majority of engineers are more apt to consider land surveyors as technicians rather than as professional men. In a few States, perhaps not exceeding five, surveyors are looked upon with favor.

Within land surveying practice there are many grades of workers. One of our failures, and many engineers' failures, is to properly distinguish between chainmen, draftsmen, technicians, and the professional level. On highway work the engineer in charge has surveyors who make measurements to determine the shape of the ground. They are merely measuring the ground as it exists and recording the facts as they are. To be sure, the surveyor must have superior ability in knowing how to use instruments and how to make measurements, but this is purely technical. He does not design the road nor does he utilize his measurements. Again the engineer may tell the surveyor to grade-stake a road in accordance with a given plan. Since no design or judgement is involved, it is a purely technical matter. To the average engineer the surveyor is a technician who carries out his orders. And often he is just that. But the engineer frequently overlooks the fact that there is a professional land-surveyor level.

Perhaps one of the greatest attributes of a successful practitioner is measured by how well he gets along with others. Knowledge alone does not make a professional man. He must have knowledge and use that knowledge in guiding, teaching, or instructing

others, and his success in this depends upon how well he can influence others. We have all seen those who have superior knowledge, but who are pugnacious, contrary, unyielding, and never wrong. We have all seen those that display the fiery impulse of an infuriated clam and those that have the backbone of a wet noodle. Such types seldom succeed as professional men. Often such individuals fail to understand why they cannot get business and as a final desperate effort they assume that price is the reason and resort to trying to get business by the nonprofessional means of being the lowest bidder.

The problem of varying ability is common to all professions. Some doctors have good public relations, others do not. This does not explain why one profession is superior to another, it merely explains why some individuals attain greater success than others. To a certain extent all professions are judged by how each individual member gets along with others.

Our Present Shortcomings.

There is no doubt but what land surveying is entitled to professional status of some sort within the broader meaning of the term; the courts indicate such by their decisions. But there is also no doubt that we, on the average, do not measure up to the three learned professions or for that matter, to any of the other better professions.

In the minds of most surveyors there is no question but what they would like to be looked upon with the same respect, dignity, and standing as the doctor, the attorney, or the clergyman. I have repeatedly heard surveyors compare themselves with doctors. No short cut to gaining this prestige exists; it must be earned, and as yet, on the average, we have not earned it.

Land surveying can be a profession approaching the level of the learned professions, and whether we wish it to be so or not is ours to decide by group behavior—that is action, not wishful thinking.

Education and knowledge can never be purchased; each individual must acquire these by his own efforts. All the money in the world will not cram knowledge into the heads of those unwilling to learn. It is recognized that all education is not acquired in colleges; but colleges are the major source of education. They are the repository or storage place for accumulated knowledge.

All learned professions have as one characteristic, specialized and extensive knowledge in a particular field, and that particular field is offered in the curriculum of many institutes of higher learning. How many colleges offer a degree in land surveying? How many offer a masters degree in geodesy? Colleges simply do not recognize land surveying as a learned profession, and until they do we will not be classified as professionals.

The major deterrent to our becoming a learned profession is our low requirements for the right to practice. So long as we have low admission requirements, we will have low standards of practice and low public opinion. A person must know what is right and wrong before he can practice right. If we are satisfied with our present low professional standing, that of a subprofession not measuring up to the standards of the better professions, we should do nothing. But if we want to improve our standing, we must raise our standards.

Without ethics, a group of people can never be a profession. Realizing this, most land surveyor groups have adopted some form of ethics; but these ethics are without effective enforcement. The lawyer, for failure to abide by ethics, can be disbarred. The doctor can be removed from the American Medical Association and thus lose hospital practice rights. The clergy can be defrocked. Who has ever heard of a land surveyor being de-licensed for failure to observe ethics? We must seek and find a way to enforce ethics.

An essential part of the definition of a profession is service to others, i.e., knowledge is used to aid and assist fellow men. I presume this means all men. If we are a profession, should we not have free exchange of information between ourselves? How many secretly hoard survey evidence and refuse to allow fellow practitioners the privilege of knowing what formerly existed? Are we a

business in this matter or are we a profession? Fortunately, in our area, but not in all of our State, we do have extensive free exchange of information, but from conversations with various surveyors in many areas, I can only assume that this practice is not as widespread as it ought to be.

In California's Owens Valley we have two lakes. One is fresh and trout are in it. Trees spread their branches over it and children play along its shores. A river flows into this lake and out into a second lake. Here in the second lake are no fish and no children's laughter. Travelers choose other routes. Neither man, beast, or fowl will drink of its waters. There is a difference between the two lakes. The first lake receives fresh mountain water. For every drop that flows in another drop flows out. The other lake is shrewder. Every drop it gets, it keeps. The first lake receives and gives, the second lake receives, does not give, and is salted to death. Are we going to be like the first lake and receive and give information, or are we going to be like the second lake and jealously hoard professional information?

Among the many things that would elevate the surveyor to higher stature, perhaps the most important, is the word "agreement". All of us have heard the complaint, "it is a notorious fact that no two surveyors are in agreement on the position of a corner". Differences between surveyors are a cause of degradation. We prove by our own survey monuments that we are incompetent, since we cannot all arrive at the same location using the same written deed.

Differences are caused by numerous circumstances, some of which can never be remedied by the surveyor, but in all too numerous instances differences are caused by surveyors. We, in California, have overcome much of this by certain practices which ought to be a part of all registration acts. Specifically these are:

1. Filing public records of surveys showing all evidence found and all points set.

2. Placing the surveyor's license number on every monument set.

The surveyor is given exclusive privilege to monument property lines, and in exchange for this exclusive privilege he ought to and does have obligations to the public. Original monument evidence should never be the exclusive property of one; it should be the knowledge of all.

Deeds have a chain of title back to their inception. The validity and correctness of a deed is based upon that chain of title. Similarly monuments should have a continuous chain of history. The original surveyor sets a stone mound for the section corner. Surveyor number two finds a stone mound for the section corner and sets a 2″ iron pipe. Surveyor number three finds the 2″ pipe and sets reference points 30 feet on each side of a new proposed road. Surveyor number four finds the reference monuments and resets the true section corner in the centerline of the new road. Surveyor number five finds the new monument in the centerline and wants to prove its identity and the correctness of its position. How can he do this without a continuous record of what surveyors numbers 1, 2, 3 and 4 did? The surveyor who discovers and alters evidence, has a duty to record and maintain a record of what he did, and unless that record is a public record, it will soon be lost with the death of the surveyor. This is the reason that California has a law that makes it mandatory to file a record of survey under certain circumstances, and these circumstances are:

(a) Material evidence, which in whole or in part does not appear on any map or record previously recorded or filed in the office of the County Recorder, County Clerk, municipal or county surveying department or in the records of the Bureau of Land Management of the United States.

(b) A material discrepancy with such record.

(c) Evidence that, by reasonable analysis, might result in alternate positions of lines or points.

(d) The establishment of one or more lines not shown on any such map, the positions of which are not ascertainable from an inspection of such map without trigonometric calculations.

On the record of survey must be shown all evidence found and all new points set.

Whenever a monument is discovered it

has little value without evidence of its origin. By requiring a license number on every point set by a surveyor, the identity of the point can usually be established by calling the surveyor. This is an incentive to exchange information and maintain liaison between surveyors. If a discrepancy is discovered, the first surveyor can be immediately notified and differences worked out prior to a client's display of a desire for revenge on a hostile neighbor.

Conclusions and Recommendations.

Any single land surveyor can attain outstanding eminence as a professional man. Of necessity his knowledge would have to be broad enough to include an intimate acquaintance with such related fields as geodesy, photogrammetry, cartography, and land law. His only limitations would be his own desires and his own ability to push his knowledge, his behavior, his conduct, and his ethics to the forefront. A good professional man cannot be a recluse; one of the essential definitions of a professional man is that he serves the public and serves them well.

There are bright spots throughout the United States. Ohio has equal or almost equal knowledge requirements as compared to the civil engineer. California and Massachusetts have good standing, though even here improvements can be made. Minnesota surveyors, by their successful sponsoring of the platting law, have enormously enhanced their professional standing.

Unfortunately those in the same group are often tarred by the same brush. If most land surveyors throughout the United States are of low professional standing, all will tend to be thought of in the same vein. If we as a group are to be thought of with the dignity and respect that we would like to command, we must all be above reproach. Among the many things that we can do to improve our standing are those areas of tentative agreement reached between the various model-law committees at the ACSM annual meeting and these are:

1. The knowledge or educational requirements of the surveyor should be raised to an equivalent level with that of the civil engineer. This does not mean that both would be given the same examination, nor that both will need to know the same subject matter. It merely means that the surveyor will need to know much more than is being asked of him in present examinations. Ignorance is a voluntary misfortune and should not be tolerated in our profession.

2. Require a minimum of 16 hours of written examination. This would be divided into two parts, one part on fundamentals and one part on professional practice. Passage of the Engineer-in-Training examination of the civil engineer or the passing of the first 8-hour test would entitle a person to take the second half on professional practice of surveyors. I am sure that if a civil engineer can pass the EIT examination he would be qualified in the fundamental mathematics of surveying.

3. The surveyor will be allowed to perform every step in the making of subdivisions. Since this would allow him to design water lines, paving, grading, etc., his examination must include these subjects. His scope of examination is increased.

4. Always keep the door open so that it is possible for a man to progress by self-education to the professional level. Formal education in college is merely one of the many ways that a man can acquire an education. A college degree is proof of theoretical training in a given area. The lack of a college degree is certainly not an indication of a man's knowledge. Many have acquired excellent educations by their own efforts. After examining present-day college civil-engineering curricula, I will not hesitate to say that possessing a civil engineering degree, is not proof of adequate training in surveying.

5. Require eight years of experience in responsible charge, four years of which may be acquired by an accredited college degree. And that college accreditation implies accreditation in surveying subjects—not thermodynamics, electricity, and the like.

These areas of agreement were attained without a contrary opinion. If these objectives can be put into practice, I am sure the professional tone of all surveying will be on

an equivalent standing with that of other learned professions.

The ASCE task committee envisioned that at a future date both the surveyor and engineer would, on the average, have equivalent planes of practice and equivalent professional standing and ideals. At such time, if each professional so desired, it would be possible for reduction to one license. Whether that is advisable or not, we need not concern ourselves; that decision will be made by the next generation.

Most registration acts are only definitions of who may practice surveying; they do not obligate the surveyor to file records of his work nor do they require him to use license numbers on monuments. By adding to most registration laws and requiring surveyors to abide by certain practices, the professional standing can be upgraded.

I have chosen the land surveyors profession because I like it and am proud of it. Although our office does do numerous engineering jobs, I never infer or imply in any way that I am an engineer. I know that we as land surveyors should have professional standing, but I also believe that we have not acquired the standing we ought to have. These remarks were designed to point out some of our weaknesses and suggest some remedies.

I started out with a thought and wish to close with the same thought. Professional stature is not gained by self proclamation. Professional stature must be earned and can only be measured by what others think of us. If you want to find out whether you are a professional man, ask what others think, don't ask yourself. If you want to be a professional man, earn that right.

Excerpt From Recorded Deed

EDITOR'S NOTE.—We are indebted to ACSM member Richard S. Hogan, Licensed Land Surveyor, of Sebastopol, California, for this excerpt from a recorded deed, in which it soon becomes evident that the surveyor "stood up so straight he leaned over backward" and used up about everything in his toolbox in his effort to permanently (?) mark the P. I.'s of his road-centerline traverse. This reminds us of the sign posted near the piano player in a western dance hall in the early days, when they killed more people with six-shooters than they did with automobiles—"Don't shoot the pianist, he's doing his damnedest!" Italics ours.

"Beginning at a point marked by a *1¼ inch pipe* driven to the surface of the ground in the south side of the County road leading westerly from Mark West station to Guerneville, said point is North 89° East 20 feet from a stake marking the N.E. corner of a tract of land deeded August 16th, 1900 by John M. Laughlin to John W. Mitchell, and recorded in Book 191 of deeds page 42 and S. 89° West 20 feet from lands of M. C. Meeker; thence along the center line of a private road S. 0° 35′ E. 2630 feet to a *forked iron pin* driven to the surface of the ground; thence S. 79° W 105.2 feet to a *half inch iron bolt;* thence S. 20° 45′ E. 640.9 feet to a *½ inch bolt;* thence S. 20° 30′ E 641 feet to a *pair of iron tongs* driven to surface of the ground from which a five pronged apple tree 14 inches in diameter marked "B.T." bears N. 15° E 47 feet distant; thence N. 69° 45′ E 179 feet to an *iron wrench* driven to surface of ground 20 feet N. from the N. end of a bridge and from which an apple tree 5 inches in diameter marked "B.T." bears S. 37° 15′ W 33 feet distant; thence S. 21° 30′ E crossing Mark West creek 156 feet to a *⅜ inch bolt with hook on end* driven to surface of ground; thence N. 83° 15′ E 182 feet to *a file* driven to surface of ground; thence N. 76° 15′ E 180.6 feet to *file* driven to surface of ground from which a live oak 3½ feet in diameter bears N. 15° 30′ W 65 feet distant; and a white oak 2½ feet in diameter bears N. 37° 30′ E 63½ feet distant; thence N. 67° 30′ E. 169.4 feet to *pair of pruning shears* driven to surface of the ground; thence S. 23° E 398 feet to a *1½ inch iron pipe* driven to surface of the ground from which a white oak 2 feet in diameter marked "B.T." bears N. 48° E 42½ feet distant; thence N. 77° 15′ E 1329.3 feet to a *flat iron bar ¼ inch by 1 inch* driven to surface of the ground from which a white oak 20 inches in diameter marked "B.T." bears S. 85° 45′ W 254 feet, thence S. 22° 45′ E 2827.3 feet to *½ inch iron pin* driven to surface of the ground in the north line of the County road leading from Fulton to Guerneville and 31 feet S. 22° 45′ E. from center line of Guerneville branch of S.F. and N.P.R.R.

Link Added to Underwater Mountain Chain

The ocean was forced to give up another of its secrets recently when a Coast and Geodetic Survey ship detected an unusual hump on the ocean floor in the Gulf of Alaska. The unusual hump turned out to be an 8,700-foot seamount or underwater mountain.

The discovery was first reported by Captain Ira R. Rubottom after deliberately sailing the Survey Ship *Pathfinder* through an uncharted spot in a chain of charted underwater mountains.

When the echo sounder revealed the telltale rise in the ocean floor the *Pathfinder* reversed her course and crisscrossed the area in question. After further processing of the soundings, hydrographers had an almost complete picture of the seamount which is a flat-topped cone that measures 12 miles in diameter at the base, 1¼ miles across the top, and 8,700 feet high. The almost perfectly flat top, which is 3,984 feet underwater, is marred by a slight peak in the center.

Although other seamounts more than two miles high have been found in this region, the new discovery, located 56° N and 143.2° W, forms a significant link in a chain stretching southeastward across the Gulf of Alaska from Kodiak Island toward Vancouver Island. This is the 20th one to be located in the 600-mile chain, which begins on the floor of the Aleutian Trench 100 miles east of Kodiak Island, and it lies about one-third of the distance from Kodiak to Vancouver.

The new seamount is approximately the 160th discovered in this extensive Northeast Pacific region by the Coast and Geodetic Survey ships on their spring and fall trips to and from coastal survey areas in western and northern Alaska, the Aleutians, and in Bering Sea waters.

Of interest are two falsely reported seamounts in the area, one of which was said to have been the cause of a serious shipwreck. When the *Washington Mail* broke in half in rough seas on March 3, 1956, 300 miles southeast of Kodiak Island, is was claimed that a seamount caused the wreck. The Coast and Geodetic Survey ship *Pathfinder* sounded a 1,000-square-mile area at the reported position, but found no depths less than two miles. Another pseudo seamount was reported to rise 1½ miles to a depth of 70 feet, 75 miles off Vancouver Island, but repeated sounding over a large area indicates that the original reporting may have been caused by echoes from the back of a whale.

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Errors in Measuring Distances by Offsets

By D. R. W. WAGER-SMITH

CONSULTING CIVIL ENGINEER

MOST SURVEYORS, at one time or another, have measured a distance by having the forward rodman take a 90° offset to his backline, and then measuring with the transit the angle subtending the extremities of the offset. Perhaps, like the writer, they have speculated on the precision of measurements thus made. Doubtless they have had a clear concept of the three principal sources of accidental error entering into such measurements. Perhaps they have wondered about the interplay of the three variables and the influence this interplay might have upon the final result of a single measurement or upon a series of such measurements. Frequently the forward party is at a considerable distance from the transit and careful supervision of its activities is infeasible. Frequently there is not available to the forward party any very precise means of determining the offset angle.

The writer recently became curious concerning the interrelationship of the variable errors in measuring distances of several thousand feet. Lacking the mathematical dexterity to derive answers through a series of fairly complicated simultaneous equations involving three variable unknowns, he assigned reasonable values to the variables, combined them in a number of different relationships, and ground out the results on a calculator. Perhaps the results will prove interesting to others.

THE VARIABLES

NOTE.—For complete agreement between Figure 1 and the text of this article, in the explanatory notes in Figure 1 read "B" for "Z".

In Figure 1, the transitman is a *A*. *B* is a point on his forward line. The distance *AB* is unknown. The forward party, at *B*, measures an offset which is intended to be the line *BC*, at 90° to *AB*. This operation introduces two of the three major accidental errors. First, the offset angle may be greater or less than 90°; and, second, the true length of the offset may be greater or less than the length reported. Now the transitman measures the angle subtending the extremities of the offset. He believes he is measuring the angle *BAC*, but he may be measuring *BAD* or *BAD'*. Even were he measuring the angle *BAC*, however, his calculations would be subject to the accidental error entering into the measurement of the angle at *A*.

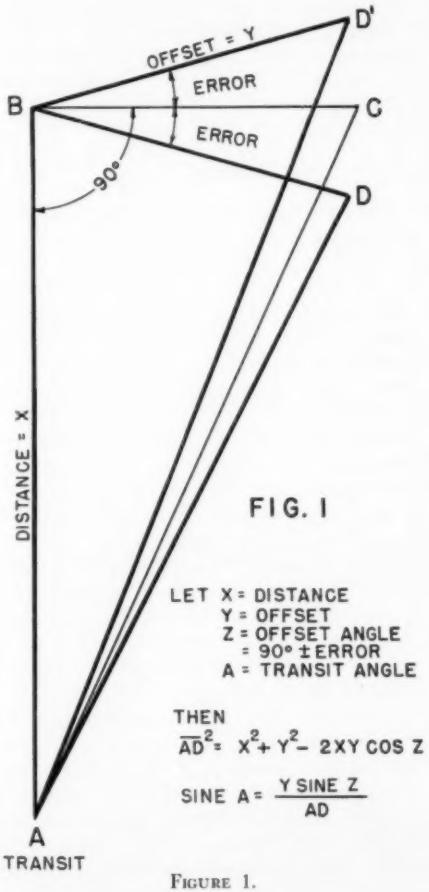

FIG. 1

FIGURE 1.

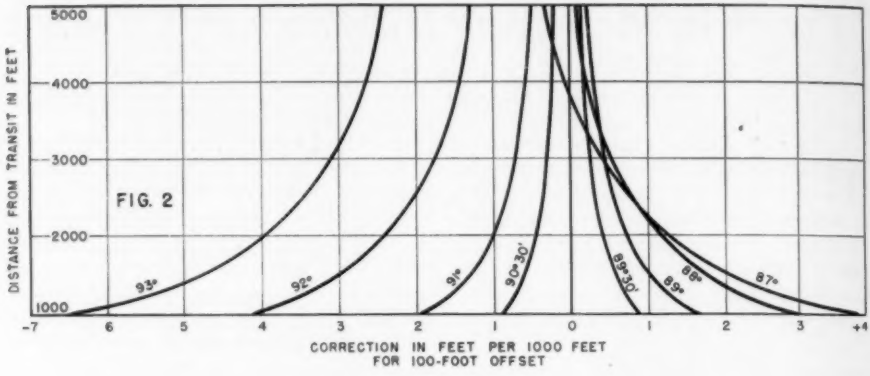

FIGURE 2.

How does the interrelationship of these three errors, each either positive or negative with respect to the calculated length of *AB*, affect the accuracy of a single measurement or a series of such measurements?

THE OFFSET ANGLE

First, let us assume the offset to be laid off exactly 100.00 feet long. Then let us assume the angles *BAD'* or *BAD*, as the case may be, to be measured with exact precision. Now let us vary the offset angle between the rather extreme limits of 87° and 93° to the backline. And let us also assume five different lengths for the line *AB*, namely 1000, 2000, 3000, 4000, and 5000 feet. Under these several conditions let us compute the total error and the error per 1000 feet which is introduced into the transitman's calculations of the length of *AB* by reason only of an erroneous offset angle.

There is doubtless some simpler way of doing it, but the writer first found the length of *AD'* (or *AD*) by the law of cosines, making the offset 100.00 and assigning to *AB*, successively, each of the five assumed values. Then he found the angle *BAD'* (or *BAD*) by the law of sines. This is the angle which the transitman actually observed. Believing that he was dealing with the right triangle *ABC*, he calculated that $AB/100 = \text{cotan of}$ observed angle. This gave him values other than the actual length of *AB*. The magnitude of the error in feet per 1000 feet in the computed length of *AB* is shown in Figure 2.

Several interesting characteristics of the corrections shown in Figure 2 are worthy of note:

(1) If the offset angle be less than 90° to the backline by a given amount, the resulting error in *AB* will always be less than it would if the offset angle were greater than 90° by the same amount.

(2) If the offset angle be greater than 90°, the correction must always be subtracted from the calculated distance in order to secure the correct length of *AB*. This we designate as a minus correction.

(3) If the offset angle be less than 90°, the correction is sometimes additive and sometimes subtractive. Analysis reveals that the algebraic sign of the correction reverses when the value of the transit angle equals one-half the amount by which the offset angle is less than 90°. That is, if the offset angle is 87° the algebraic sign of the correction will reverse when the angle measured at the transit is 1° 30'.

(4) Considering only the error in offset angle, while fixing the other two variables at theoretically perfect values, the amount of the error in feet per 1000 feet decreases as the ratio of distance to offset increases. In other word under these conditions a short offset is advantageous.

THE COMBINED VARIABLES

For purposes of this discussion, we may regard each of the three separate errors as accidental. Perhaps this is not strictly true

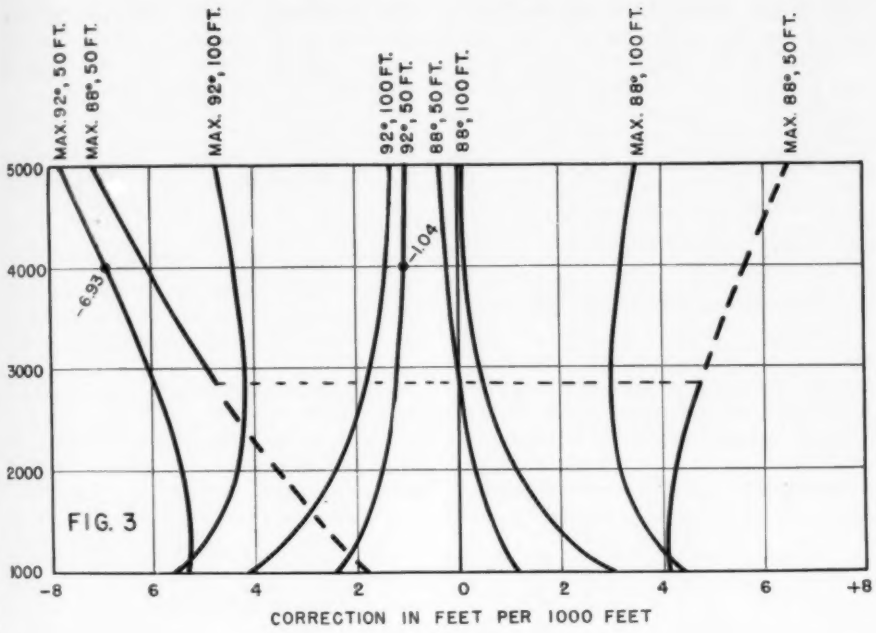

FIGURE 3.

if one considers the systematic errors in chaining the offsets, and the systematic errors introduced by instrumental maladjustment. Furthermore, as has been shown, the plus and minus corrections caused by errors in the offset angle have different values for the same magnitude of angular error over or under 90°.

But, considering the three errors to be purely accidental, the net residual error in each of them resulting from a series of such measurements might be expected to follow the general rule that $E = e\sqrt{N}$.

Sidestepping the derivation of mathematical expression for the most probable value of the error introduced by combining the three variables, lets us consider only their pattern of behavior, individually and in combination. To this end the variables are interrelated by assigning definite values to each of them, calculating the resulting corrections at various lengths of the line *AB*, tabulating the results, and plotting the curves shown in Figure 3. One series of calculations has been performed for a 50-foot offset and one for a 100-foot offset. The family of curves grouped near the middle of Figure 3 is similar to Figure 2. This group illustrates the behavior of the error caused only by an erroneous offset angle, namely 88° or 92°.

Figure 4 shows the behavior of the other two errors, namely the error in calculated distance caused by (a) the error in the transit-measured angle, and (b) the error in the length of the offset. Here, assuming the offset angle to be precisely 90°, reasonable values of error were assigned as follows: In the transit angle, ± 10″ and ± 20″; and in the length of the offset, ± 0.10 ft., and ± 0.20 ft. In order to avoid a confusing picture, only half of the actual number of curves is shown in Figure 4. Thus the negative values for erroneous offset length are omitted, and the positive values for erroneous transit angle are omitted.

It may be noted that if the transit angle is too large the correction must be added to the calculated length of *AB* to secure its

true length. Similarly, if the offset length is too long the correction must be added.

It will be observed that all curves in Figure 4 are substantially straight lines within the limits of reasonable error being considered. In other words, the corrections are directly proportional to the errors of observation. This straight-line relationship is destroyed by the corrections introduced by the error on offset angle, as shown in Figures 2 and 3.

MAXIMUM COMBINED ERROR

The outer curves (right and left) represent the maximum error which may result by combining the central family of curves with the curves in Figure 4. Thus the curve marked "MAX. 92°, 50 FT." shows the maximum algebraic sum of the corrections necessitated by a +2° error in offset angle, a ±10″ error in transit angle, and a ±0.10 foot error in the 50-foot offset length. An example of the tabulated value for this curve when the distance from the transit is assumed to be 4000 feet is as follows:

Cause	Correction (ft./1000 ft.)
+2° offset angle	= −1.04 (Fig. 3)
±10″ transit angle	= ±3.89 (Fig. 4)
±0.10 ft. offset length	= ±2.00 (Fig. 4)
Maximum algebraic sum	= −6.93 (Fig. 3)

As a matter of interest it may be noted that the minimum value of the combined corrections tabulated above is +0.85 ft./1000 ft.

The discontinuity in the curve marked "MAX. 88°, 50 FT." results from the fact that one of its components changes algebraic sign, as shown in the central family of curves.

In the main, a study of Figure 3 bears out

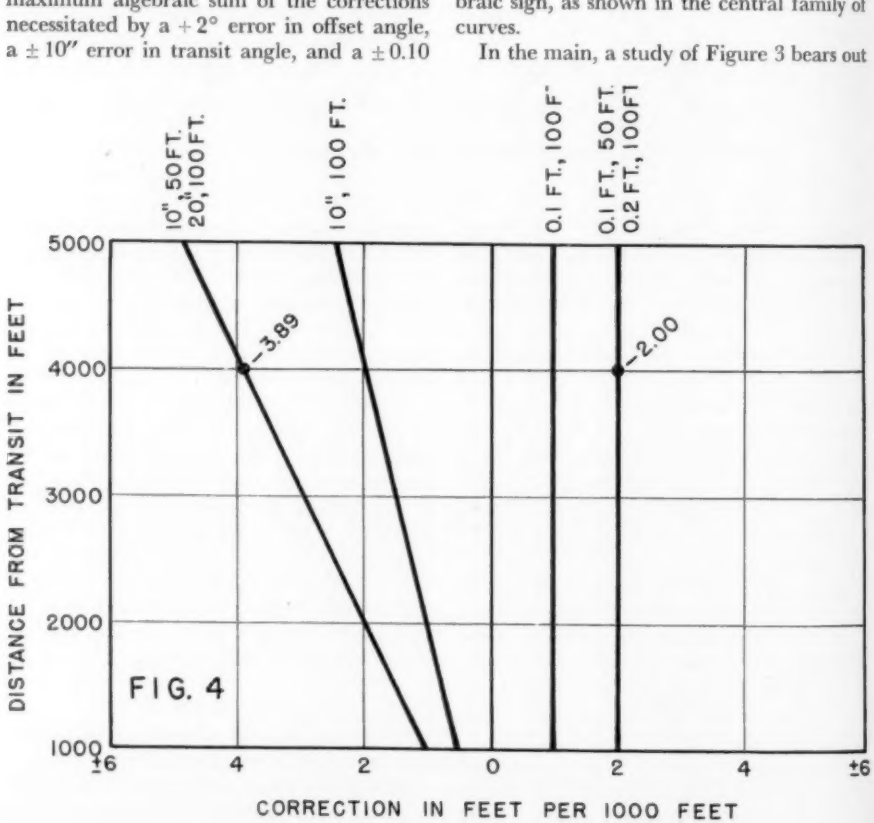

Figure 4.

the intuitive preference of most surveyors for a relatively long offset. Thus in Figure 3 the total maximum error with a 50-foot offset at 5000 feet is considerably greater than it would be with a 100-foot offset. But it is not twice as great, as is generally assumed, unless the offset angle be precisely 90°.

A close examination of the two full curves at the left of Figure 3 will reveal that, under conditions assumed, the least value of the maximum error will be attained when the ratio of distance to offset is about 30. This value decreases (i.e. the offset should be longer to attain the least value of the maximum error) as the error in offset angle decreases. But the ratio increases (i.e. the offset should be shorter) as the error in offset angle increases. Thus, if we assume a theoretical condition where transit angle and length of offset are considered to be perfect, a short offset is preferable. This generalization is borne out in Figure 2.

CONCLUSIONS

The writer finds it difficult to draw any very definite conclusions from this brief discussion. Perhaps it will have some slight value, however, in clarifying the field man's general conception concerning the probable accuracy of the measurements that he undertakes by this method.

But, if definite conclusions were to be drawn, the following might be valid:

Very large errors in calculated distance are likely to result from using crude methods of setting off the 90° angle, especially if a long offset is used. (Fig. 2)

For the offset lengths considered, a ten-to-twenty-second error in the transit angle combined with a 0.1-to-0.2-foot error in offset length can produce errors of the order of 1/150 to 1/300 in distances from 5000 to 1000 feet. (Fig. 4)

The maximum combined value of the three errors considered here may be kept near its least value by keeping the ratio of distance to offset within a range of 20 to 40. (Fig. 3)

Using a ratio of 20, and assuming perfection in offset angle and offset length, a 10″ error in transit angle will produce a linear error of 1/1000. And each 1/1000 error in offset length will produce an error of 1/1000 in calculated distance. (Fig. 4)

Finally, from the foregoing one may conclude that only through the exercise of considerable care may the offset method of measuring distances be expected to produce precise results.

Maryland County Boundary in Doubt

In 1748 Maryland decreed that "all the land lying to the westward of a line beginning at the lower side of the mouth of Rock Creek and thence by a straight line joining to the east side of Seth Hyatt's plantation to the Patuxent River should be taken from Prince Georges county and made into a new jurisdiction to be called Frederick County."

Later, Montgomery County was formed from the land in the eastern part of Frederick County, and the original boundary between Prince Georges and Frederick Counties is now the boundary between Prince Georges and Montgomery Counties—at least a part of it is. The Prince Georges-Montgomery boundary now extends from a point on the northeast boundary of the District of Columbia to the Patuxent River.

Washington, D. C., has spilled over into both Prince Georges and Montgomery Counties, and a boundary that originally passed through open country with very little settlement now cuts through the City of Takoma Park, Maryland, and a considerable number of built-up sections.

There have been at least three surveys of this boundary, each survey producing slightly different results. Time and intensive settlement have caused this boundary to become more and more difficult to locate.

Tax matters are becoming increasingly complex, police jurisdictions are in doubt in some places, and it is difficult to enforce code regulations if you are not sure which code applies in a given instance.

Officials of the two counties are now seeking an individual or organization that can bring order out of chaos. If any of our readers are looking for a tough nut to crack in the surveying line, they might want to apply for the job.

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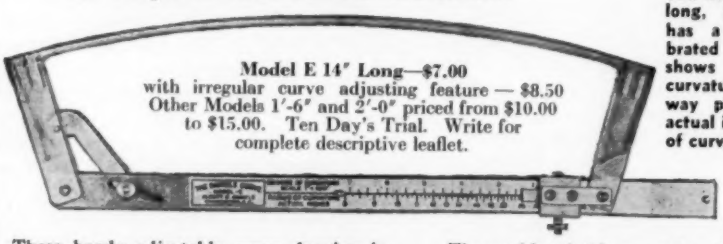

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Progress in Cadastral Surveys

By DONALD B. CLEMENT

CADASTRAL ENGINEERING STAFF OFFICER, BUREAU OF LAND MANAGEMENT

BEFORE STARTING discussion of my assigned topic, I would like to express my appreciation of the opportunity of appearing on this platform. Since I am so definitely identified with the Bureau of Land Management, I consider that my appearance here is a recognition of that Bureau and an honor to the surveying service with which I have been connected for a great many years.

The title of this paper—"Progress in Cadastral Surveys"—sounds rather innocuous and I thought it would be a simple and easy matter to tell of the progress we have made in the field of cadastral survey of the public lands. But as I tried to develop that field, I found that there is more to the subject than would appear at first glance.

To start with, it would be well to understand what is meant by cadastral surveys. Many people have looked at me with incomprehension written on their faces when I have said, in response to a question regarding my work, that I was engaged in cadastral engineering.

Cadastral surveys have been defined by the Pan American Institute of Geography and History in a document entitled "Modern Cartography, Base Maps for World Needs," published by the United Nations in 1949, as follows:

"Cadastral surveys in general create, reestablish, mark and define boundaries of tracts of land. Such surveys, unlike scientific surveys of an informative character which may be amended with changing conditions or because they are not executed according to the standards now required for accuracy, can not be ignored, repudiated, altered or corrected, and the boundaries created or reestablished can not be changed so long as they control rights vested in the lands affected.

"The official record of a cadastral survey ordinarily consists of a drawing or map and a written description of the fieldwork. The drawing represents the lines surveyed, showing the direction and length of each such line; the boundaries, description, and area of the parcel of land; and, as far as practicable a delineation of the topography of the region, including a representation of the culture and improvements within the limits of the survey."

That definition is broad enough to cover a large field of land surveys and subdivisions. The cadastral surveys with which I am most familiar are those relating to the survey and resurvey of public lands of the United States. It is in that field that I shall discuss the progress that has been made. I feel that the story would not be complete without a look into the future and I shall express an opinion as to what lies ahead for us in this field of work.

By the way of background it might be well to remember that the cadastral survey of the public lands is based upon laws enacted by the Congress. The act of the Continental Congress approved May 20, 1785, clarified and strengthened by the acts of the Congress of the United States approved May 10, 1800, and June 11, 1805, is the basis for the system of rectangular public land surveys upon which rests the title to more than 75 percent of the land in the United States, exclusive of Alaska.

There are several definitions of the word "progress." One of these, which seems quite applicable to the theme of this paper, means "to advance to an objective." Considering the completion of the cadastral survey of the public lands in the United States as an ultimate objective, we may readily estimate the progress that has been made toward that goal.

The nucleus of the public domain of the United States embraced the lands ceded by the several Colonies to the central Government. This constituted the area north of the Ohio River extending from the west

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boundary of Pennsylvania to the Mississippi River, plus the area extending from the west boundary of Georgia to the same river. Additions to the public domain were made by the Louisiana Purchase in 1803; the Florida Cession in 1819; the Annexation of Texas in 1845; the Oregon Compromise in 1846; the Mexican Cession of 1848; the Gadsden Purchase of 1853; and, finally, the Alaska Purchase of 1867. It is in this vast area, totalling more than 1 billion 800 million acres that the cadastral survey of the public lands has been carried on. Starting 1785, on the north bank of the Ohio River where the west boundary of Pennsylvania crosses that river, those surveys have been extended in advance of settlement, from the Canadian border to the Gulf of Mexico and westward to the Pacific Ocean.

In terms of quantity, of the approximately 1 billion 441 million acres of public domain in the main body of the United States, some 1 billion 329 million acres have been surveyed. Of the 365 million acres in Alaska, less than one percent have been surveyed.

Those statistics may be somewhat misleading for the reason that the total area reported as surveyed does not include the area of a great quantity of private land claims to which title was confirmed without survey under the rectangular system. Also, there are substantial areas in Arizona, California, and Utah in which "skeleton surveys" have been executed in recent years for the sole purpose of identifying certain sections in each township in satisfaction of grants made to the States for the support of public schools. Since the townships have not been entirely subdivided, they are regarded as unsurveyed for statistical purposes. In addition, there are areas over which the extension of the rectangular survey system probably will never be required—areas in permanent reservations such as the large National Parks, etc. It is my opinion that the area of public lands requiring cadastral survey in the 11 Western States may be considered to be in the neighborhood of 50 million acres.

This area of unsurveyed land represents less than four percent of the total area of the public domain in the main body of the United States. It must be realized, however, that this remaining four percent is what is left after more than 170 years of selecting the best land. It represents the poorest of the land and presents the greatest problems in execution of surveys.

As to Alaska, as I have said before, less than one percent of the area of that State has been surveyed. Under the terms of the act admitting Alaska to statehood, the new State is authorized to select over 103 million acres of public land within the next 25 years. The act requires that the exterior boundaries of the lands selected shall be surveyed before title is transferred from the Federal Government. Additionally, a regular program of surveys required for administration of the public land laws in Alaska must be continued. It does not take much imagination to visualize the magnitude of our cadastral surveying problem in Alaska.

What has been said so far relates to the original cadastral survey of the public lands, by which I mean the initial establishment of the corner monuments marking the township boundaries and section lines. However, there is another major field of operation involving the resurvey of the public lands. This work is undertaken for the purpose of recovering and redefining the boundaries of the remaining public lands for proper administration and management of those areas where the original corners have been obliterated or destroyed by action of the elements or by construction in the development of the areas.

We consider that there is a present need for the cadastral resurvey of approximately 50 million acres of the public lands. The scope of that work is expected to remain fairly constant for several years; the advantages deriving from properly marked property boundaries create a need for the extension of the resurvey work to other lands. There are about 175 million acres of public land in the main body of the United States under the jurisdiction of the Bureau of Land Management, and it is estimated that much of this area eventually will require resurvey to permit effectual management of the lands and resources.

A few years back, in order to carry out the provisions of the Outer Continental Shelf Lands Act for the leasing of areas offshore, there were developed a series of leasing maps setting up suitable blocks on the Outer Continental Shelf. These blocks are defined by coordinates based on the appropriate State grid. The lease-block diagrams show the position of each of these blocks and the control stations established on shore. These lease-block diagrams have been prepared for the entire area of the Outer Continental Shelf offshore from Louisiana, for a substantial portion of the area of the Outer Continental Shelf offshore from Texas, and for a limited area offshore from Florida. Those diagrams have been entirely adequate for leasing purposes and for the development of the mineral resources in the area involved.

The success attained by preparation of the leasing maps in the offshore areas led us to consider the applicability of this principle in the unsurveyed areas of Alaska and the larger blocks of unsurveyed lands in the Western States. We now have an active program for the preparation of protraction diagrams showing the theoretical extension of the rectangular survey system over the unsurveyed areas. In Alaska the protractions are based upon the computed geographic position of each township corner. It is then a relatively simple matter to determine the azimuth and distance from the nearest control station to a particular township or section-corner position. In the Western States the protracted positions for the corners in the unsurveyed areas are based on the control afforded by the public land surveys forming the perimeter of the unsurveyed areas. These protractions are a very definite aid in the administration of the public lands and meet many of the needs for land description. Regulations recently adopted require that these official protractions be used for the descriptions for oil and gas lease offers on the unsurveyed lands as well as other lease descriptions; it is thought that these protractions will meet many of the needs in the administration of the public lands involving description and location of areas, short of passage of title. That program is in full swing in Alaska and is well under way in the Western States, substantial progress having been made on the protractions in Arizona and Montana. It is estimated that the program for protraction of the rectangular surveys over the unsurveyed areas of Alaska will be substantially completed this year.

At various times over the years, studies have been made and plans outlined for the completion of cadastral survey and resurvey of the public lands within a given period of time. One such plan formulated in 1955 contemplated the completion of the work in 10 years. Of course that was prior to the statehood of Alaska which has since then created a newer, larger, and higher priority. At this writing, a long-range plan covering not only completion of the cadastral survey of the public lands but orderly progress of the administration and development of the public land areas is under study.

The foregoing indicates the progress which has been made in terms of quantity production in the survey of the public lands and the steps that have been taken to provide interim data as to the location of township and section boundaries in the unsurveyed areas. To my mind, it is manifest that tremendous steps have been taken toward the ultimate completion of this tremendous job. Another definition of progress is the action or process of advancing or improving by marked stages or degrees; gradual betterment.

Having considered the progress that has been made in terms of quantity production, I think we should also consider the progress that has been made in terms of improved methods and equipment.

Very little is of record concerning the instrumental equipment available and used in the very early cadastral surveys. We know that there were no highways, railroads, or airlines such as we take for granted today. The survey parties must have proceeded on foot or, at best, by horseback or river canoe from the nearest settlement to the location of the work. Those parties probably lived off the land to a great extent and took with them only such provisions as they could carry readily.

Not too long ago I ran across one refer-

ence to a survey party operating in Michigan in the early days, describing the provisions which they took in with them as a supply of salt pork, a bag of beans, and a barrel of whiskey. Also, the following extract from the field notes of the survey of T. 8 S., R 2 W., Arkansas is indicative of the trials of the surveyor operating in that remote region in the winter of 1830. That extract reads as follows:

"I followed down what I thought to be the cutoff about two miles, expecting every bend to come to its mouth in the White River, at which point I had ordered my camp. . . . Crossed White River to a Mr. Capler's where, to my great surprise, I learned that it was the Arkansas River that I had crossed in lieu of the cutoff and that I was then a mile above where it communicated with the Arkansas. Mr. Capler's hospitality afforded myself and hands shelter from a desperate storm of rain, thunder, winds, etc., through the night . . ."

Modern maps show this immediate locality to be cut up by channels of the White and Arkansas Rivers and connecting sloughs. It is easy to understand how the surveyor became confused. Incidentally, this survey was made by Charles H. Pelham, who later became Surveyor General of Arkansas and still later was appointed the first Surveyor General of New Mexico when that office was created in 1854.

Even up to recent years, our cadastral survey parties often considered themselves fortunate to be housed in tents. Sleeping under the stars was not at all uncommon and the protection of a tent was at times thought to be classed as a luxury.

In contrast with the conditions which I have just described and as an indication of progress made in that phase of the work, last fall I visited one of our survey camps operating in a remote area in the west desert of Utah, probably 50 miles from any settlement or habitation. We drove directly to the camp site, most of the distance over good blacktop highway. On arrival at the camp, we found house trailers for sleeping quarters, mess hall, and field office. There was running water piped from a spring in the mountains, propane gas for cooking and heating, and electric power for lights and radio provided by a portable generator. The field parties rode in trucks from the camp to the location of their fieldwork where conditions permitted. They had a helicopter for transportation in the most rugged mountain areas; it was a matter of but a few minutes flight from the camp to any point in the field assignment. The field party, as well as the helicopter pilot, was in constant communication with the base camp by portable radio. At lunch time we were served fried chicken and all the trimmings, freshly baked hot rolls and pie, all prepared by the camp cook. This indicates the progress that has been made in the housing of the field parties as well as in the transportation and communication facilities.

Consider also the matter of surveying equipment. At the time of inception of cadastral survey of the public lands, the open-sight, magnetic compass was the only available direction-determining instrument, checked by rather crude observation of Polaris, with latitude determination probably by use of the astrolabe. Measurements were made with the Gunter link chains two perches (33 feet) in length. Surprising as it may seem, the conscientious and dedicated surveyors of the early days executed remarkably accurate surveys with such equipment, which we now look upon as primitive.

I believe that the first significant improvement in instrumental equipment was the invention of the solar compass by William A. Burt, a deputy surveyor engaged in the survey of the public lands in Michigan and Wisconsin.

Back in the 1830's, the deputy surveyors operating in the northern lake States experienced great difficulty in using the magnetic needle due to the deflections resulting from deposits of magnetic ores. Being mechanically minded and a student of astronomy, Mr. Burt turned his thoughts to a means of determining the meridian independently of the magnetic needle. The result was the Burt solar attachment to the ordinary surveyors' compass in use at that time, which he patented in 1836. This attachment afforded a direct, rapid, and relatively accurate determination of the meridian by a mechanical solution of the celestial triangle

—pole, zenith, sun. The Burt solar compass was standard equipment in the cadastral survey of the public lands for a great many years and, in fact, it is still used to a certain extent in very heavily timbered areas of the Pacific coastal region.

The next significant development in the way of solar apparatus appeared in 1880. By that time the engineers' transit was in rather common use. In that year, Benjamin H. Smith, a deputy surveyor engaged in public land surveys in Colorado, perfected a telescopic solar attachment to be mounted on the standards of an engineers' transit. This prototype of the modern solar transit had a higher degree of accuracy and afforded the refinement of operation inherent in the engineers' transit.

The solar transit is designed for the accurate and rapid determination of the meridian at each setup independently of any control lines previously established and without reference to the magnetic meridian. The importance of these developments may be understood when it is realized that the cadastral public land surveys were projected across virgin country where no reference or control lines were available.

Along with the development of the solar transit, the cadastral surveying service of the old General Land Office developed and published the "Ephemeris of the Sun and Polaris," designed especially for the rapid field determination of time, latitude, and azimuth by celestial observation. That publication was first issued in 1910 and has been published annually since that time.

In the field of distance measurement, rapid progress has also been made. The adoption of the engineers' transit permitted the accurate reading of angles, enabling distances to be determined by triangulation. Not too long after the acceptance of the engineers' transit for ordinary surveying work, the installation of stadia wires in the telescope permitted the accurate determination of relatively short distances by stadia measurement. Shortly after the turn of the century, the narrow steel-ribbon tape came into general use for measuring distances on the surveys. When first employed on this work, these tapes were only one or two chains in length; today, steel tapes 330 feet or more in length are standard equipment on our survey parties.

In recent years, the electronic distance-measuring devices have made their appearance on our cadastral survey parties and are being used quite generally in the rougher mountainous areas. In combination with the more precise optical reading transits, they are proving to be invaluable for the rapid and accurate measurement of distances of from 1 to 30 or more miles, although we seldom have occasion to use this equipment to its maximum capacity as far as the distance is concerned. That type of operation is quite a contrast to the old ground methods and represents decided progress in this field.

Probably every weary land surveyor has dreamed of the time when that hard work could be done from the air, dropping corner monuments at regular intervals. Those dreams may be partly fulfilled before too long. Our experimental work with photogrammetry in the cadastral public land surveys has proven that it has a very definite place in our operations. The delineation of the shores of streams and lakes from aerial photographs rather than by ground meanders is accepted as good practice, and that work is done at greatly reduced cost as compared with ground methods. Experimental projects for determination of all corner positions involved in a given survey by photogrammetry are being carried on. Our work in this field to date has demonstrated that it can be done within the desired degree of tolerance, but we are still working to bring the costs down to the point where it is considered to be a practical method.

I think that it can be fairly said that what has been reported here represents great progress in the cadastral survey of the public lands as to accomplishments and in improved instruments and techniques.

In the first part of this paper I indicated that we should take a look into the future, to try and see what lies before us. In doing that, I see a vast amount of cadastral survey work required for the proper administration and management of the public lands. Much of that work will be in fantastically rough

country, in areas of extreme heat and cold, and in localities where prolonged foggy and cloudy weather greatly hampers astronomical observations. It is a job that must be done. It presents a challenge that will test the metal of those men who by choice prefer to match their wits and muscles in the solution of the many problems.

Its accomplishment also presents a challenge to the scientists and instrument makers to provide the improved tools needed to carry this program to a successful conclusion. I foresee a crying need for a relatively light-weight and portable instrument for accurate and rapid direction determination independent of celestial observation or magnetic influence. I also see a pressing need for a light-weight device for accurate and rapid distance measurement in the medium distance range, say from one-half mile to five miles. And, knowing the difficulty of securing adequate appropriations for this basic work, I hasten to add another requirement —that such equipment should be relatively inexpensive.

Again may I express by appreciation of appearing before you. Admittedly, much of what I have said may be dry and uninteresting but I hope that I have been able to convey some idea of the long forward steps which have been taken in the accomplishment of this tremendous job.

Topographic Instructions of the United States Geological Survey

The following, quoted from the Preface to Book 3, Chapter 3F5 of the Topographic Instructions of the United States Geological Survey, will serve to explain the series of notes that will appear in the "Book Notes" section of the "Books in Review" department of this Journal from time to time as the various chapters are published.
—EDITOR

The Geological Survey Topographic Instructions describe the engineering standards, methods, and procedures used by the Topographic Division in the production of topographic quadrangle maps. Although the instructions are prepared primarily for the guidance of Survey employees, private individuals and organizations engaged in similar work find them a useful reference; therefore they are being published in a series of volumes. The preceding Topographic Instructions were published as Geological Survey Bulletin 788, in 1928. Since then, many supplements have been issued in the form of technical memorandums, and a considerable part of the present manual has been prepared in looseleaf form for use within the Topographic Division. Where applicable, all preceding instructions are incorporated into the present manual.

The Topographic Instructions are divided into five numbered books; each book contains one or more parts, designated by letters; and the parts are divided, in turn, into numbered chapters. In preparing the manual for publication the chapters have been grouped into volumes, in the established sequence, so that each volume covers a single subject or phase of activity, as nearly as possible. The series of volumes describes all the steps of map production, generally in the order in which they are carried out. The complete series will constitute a comprehensive manual of topographic surveying and mapping.

Surveyors Find Witness Trees 131 Years Old

Emmet Kennedy of Oak Park, Illinois, sends in a clipping from a Fort Meyers, Florida, newspaper that tells of a land surveying crew working deep in a Florida swamp that has located an original 1829 government survey corner and found that three of the four witness trees were still standing.

Two of the trees were cypresses and the other was a large live oak. Cutting away a six-inch-thick growth, the original markings, "T4,R10, S34," were still in the tree, and the slab which was peeled away had a raised, reversed image of the inscription.

It is rare that any of these trees are found now after so many years of logging, forest fires, and land clearing. Perhaps there is still hope for us here in Illinois!

The Illinois Surveyor

Electrotape—
A Surveyor's Electronic Eyes

By CHARLES B. HEMPEL

PROJECT ENGINEER, CUBIC CORPORATION

ELECTROTAPE is a new electronic surveying tool which uses microwave transmission to measure distances up to 100 miles with an accuracy of 1 inch plus 3 parts per million.

Identical units are placed at opposite ends of the baseline to be measured, and the round-trip transmission times are determined from counter readouts on the Electrotape front panel. These transmission times, appropriately corrected for atmospheric and other factors affecting the velocity of microwave propagation, are exactly proportional to the distance between the two units.

Measurement can be made from either unit; a built-in voice-communication system facilitates field operation. Electrotape units are easily portable, are mounted on standard surveyor's tripods, and can be powered by standard automotive batteries.

GENERAL DESCRIPTION

Each Electrotape unit consists of three major assemblies (measurement, antenna, power supply) whose total weight is 49 pounds.

The measurement assembly contains the radio-frequency section, receiver, modulation generator, phase detector, automatic-frequency-control section, controls, and dial indicators. It incorporates variable-intensity front panel illumination, and accepts the instrumentation fastener of the standard extension-leg surveying tripod.

The antenna assembly includes a parabolic reflector, waveguide feed, and mechanical coupling for attaching the reflector to the rear of the measurement assembly. The parabolic reflector focuses the Electrotape's microwave output in a beam approximately 6° wide.

The power-supply assembly converts 12- or 24-volt direct current to the six voltages, from – 250- to + 300-volt direct current, required to operate the measurement assembly. A front-panel switch on the latter permits operating any Electrotape unit in either the interrogator or responder mode, as desired.

In addition to the major assemblies, each Electrotape unit includes a headset with cord, an interconnecting cable, a battery cable, and a pocket-size propagation-velocity computer. The equipment operates at all temperatures from – 40° to + 125° F.

PERFORMANCE

Accuracy

Electrotape accuracy depends on several factors, of which the most important are index of refraction, multipath (topographic effects), and circuit stability.

The greatest single limitation on the basic accuracy of all optical and electronic distance-measuring is posed by errors in determining the index of refraction (or the velocity of electromagnetic energy) over the propagation path involved. This velocity depends on local pressure, temperature, and humidity all along the path, but normally surface meteorological conditions can be measured only at the two terminal points. In practice, the index-of-refraction value used is an average based on meteorological readings taken at both units before and after a set of distance measurements.

When an electromagnetic wave follows an ideal single-path transmission, it is delayed in time and attenuated, but it is not distorted. If, however, the wave travels via two or more paths, the received signal may exhibit distortion or phase error. Such multipath transmissions may be caused by ground reflection, reflection from buildings, mountains, etc., or an irregular variation of the index of refraction. Reflection from

Communication via the two-way radio aids the surveyors to train the remote Electrotape units until a "strong" signal is transmitted and received by both units.

surrounding terrain can occur only if the terrain is "illuminated" by the propagated energy; therefore Electrotape uses a highly-directional antenna to confine the signal to a narrow beam with a low side-radiation level. Other phase errors can usually be eliminated by performing range measurements at several carrier frequencies, and averaging the results.

Electrotape operation requires radio line-of-sight conditions between the two units. These differ somewhat from visual line-of-sight conditions in that obstructions, such as buildings or scattered trees, present no problem unless they are very close to one of the units. Intervening mountains and hills do not ordinarily allow sufficient signal to pass between units, although in some cases a phenomenon called "obstacle gain" produces a signal much stronger than is normally expected. In general, the units should be high enough to overcome the effects of earth curvature and local obstructions.

The delays introduced in the Electrotape electronic circuits are minimized by specialized design, and are eliminated by employing an additional modulation frequency. The latter technique depends on the fact that the Electrotape phase data are obtained indirectly as the phase difference between two signals separated in frequency. These two signals differ in phase only by the delay that the difference frequency undergoes during transmission. Their phase shifts in the Electrotape circuitry are nearly the same and cancel each other.

Because Electrotape accuracy is directly dependent on the accuracy of the modulation frequency, the precision reference time

standard is maintained stable to within one part per million. As noted earlier, this stabilization is accomplished through the use of a temperature-controlled crystal oven. The signal level in all circuits is adequate to eliminate errors due to electrical noise.

Range

Although Electrotape design specifications require operation only up to 50 miles, a number of measurements exhibiting the specified accuracy have been made at ranges of 50–110 miles. Electrotape has no inherent minimum operating range; in practice, however, the minimum useful range is dictated by the shortest distance at which the user can tolerate a 1-inch error.

Environmental Effects

The nominal Electrotape accuracy (1 inch plus 3 ppm) has been maintained under environmental conditions ranging from subfreezing mountain peaks to 100° + desert sites. The intervening topography has included the extremes of heavy forestation, bare rocks, and large bodies of water.

Reliability

Electrotape operation has been marked by high reliability. In many months of field operations, involving transportation by jeep over rough terrain, very few equipment breakdowns occurred. Most of these were due to broken wires or solder joints, emphasizing the basic excellence of Electrotape's electronic design.

FIELD OPERATION

Measurement Procedure

A complete Electrotape distance determination, including unpacking equipment, tripod setup, equipment warm-up, meteorological observations, establishing contact with the remote unit, and data recording, requires only 15 minutes. Only one operator is required at each unit. During warm-up, the operators can position the equipment over the sites, measure meteorological conditions, and establish voice contact.

The measurement procedure (rotating the digital dial until the null meter reads zero) is repeated for several settings of the range-channel selector and carrier-frequency control. Other controls, such as a volume control and panel-light-intensity control for night operation, are included for operator convenience. A go/no-go monitor permits unskilled personnel to determine readily that all Electrotape circuitry is operating properly.

Set-up of the two remote Electrotape units complete, the surveyor begins rapid microwave transmissions to measure the distance between the two units.

The Electrotape pocket computer allows direct determination of the microwave propagation velocity from measurements of the ambient meteorological conditions. Reduction of velocity and transit-time observations to actual distance is simple and straight-forward; it requires only a few minutes.

Operator Training

Complete operation of Electrotape itself can be learned in about 20 minutes; no previous electronic or surveying experience is required. Unskilled personnel have become qualified operators after about 2 hours in the field. A new operator usually requires 10–15 minutes to complete a measurement; a trained operator can complete

a measurement in 4 minutes. The accuracy of measurement is the same in both cases.

Maintenance

Preventive maintenance and repair can be performed by even an unskilled operator, as subassemblies are interchangeable and identical in all units. Replacement of suspected malfunctioning subassemblies on a step-by-step basis (one tube or plug-in package at time) can quickly localize any equipment trouble. In rare instances, circuit repairs will require the services of an electronic technician.

Planet Earth Film Series

The National Academy of Sciences has announced the completion of its "Planet Earth" film series. Produced under a grant from the Ford Foundation, it embraces thirteen 16-mm 27-minute educational films, available in both color and black-and-white, covering the principal fields of geophysical research which have been stressed in connection with the International Geophysical Year.

The film series, the first produced by the Academy, originated in the interest of students, teachers, and the general public in the International Geophysical Year. Extensive film footage was shot for the series in all parts of the world both during and after the International Geophysical Year. Although the inspiration for the program came from the IGY, the films give a rounded picture of man's quest for knowledge in each field, outlining the principal discoveries and ideas and raising questions that still challenge science both as regards the cosmos and the earth itself.

In the production of the films, specialists in each of the thirteen fields were called upon for guidance from all parts of the country and even abroad. Thus the scientific soundness of the films was ensured. Because many of the ideas in geophysics are abstract, animation is used as called for. Live footage ranges from laboratory experiments to field activities. The series was produced by the Academy in cooperation with the WGBH Educational Foundation, Cambridge, Massachusetts.

Of the thirteen films three are devoted to the solid earth: "The Hidden Earth" (seismology), "The Shape of the Earth" (geodesy), "The Force of Gravity." Three others explore the interface environment between the solid earth and the high atmosphere: "The Inconstant Air" (weather and climate), "Secrets of the Ice" (glaciology), and "Challenge of the Oceans" (oceanography). Seven films are concerned with the upper atmosphere and space: "Our Nearest Star" (the sun and solar activity), "The Flaming Sky" (aurora), "Magnetic Force" (the earth's magnetic field), "Radio Waves" (including the ionosphere and radio astronomy), "Cosmic Rays," "Research by Rockets," and "Science in Space" (satellite and space-probe research).

The Academy has concluded an agreement with the McGraw-Hill Book Company, Inc., to provide for distribution of the film series. In accordance with this agreement, McGraw-Hill will distribute the films, either severally or in sets, both in the United States and abroad, to educational and research institutions at a price of $80.00 for the black-and-white prints, and $150.00 for the color prints. The entire series is now available for preview at the McGraw-Hill Text-Films, 330 West 2nd Street, New York, N. Y.

COMPUTING AID AVAILABLE NOW INCLUDES PATENTED CALCULATOR

RAPID TRAVERSE TABLES contains multiples of natural sines and cosines for each minute of angle, computed to five decimal places. Order from Leo Jean Goldsmith, 1363 Elevation Road, San Diego 10, California. Price $5.

Surveying and Mapping Literature

Members are requested to send in surveying and mapping news items for publication in SURVEYING AND MAPPING.—EDITOR.

MAGAZINE ARTICLES

General Interest

PRELIMINARY CONCLUSIONS ON VERTICAL MOVEMENTS OF THE EARTH'S CRUST DETERMINED BY MEANS OF LEVELLING. M. Y. Sinyagina. *Bulletin Geodesique,* Nouvelle Serie, No. 52, 1 Juin 1959. (Preliminary data derived from widespread observations in the USSR.)

SECULAR CRUSTAL MOVEMENTS OF THE EAST EUROPEAN PLAIN AND ASSOCIATED PROBLEMS. J. A. Mescherikov. *Bulletin Geodesique,* Nouvelle Serie, No. 52, 1 Juin 1959. (Points out that problem of secular movements is connected with a number of other problems of geology, geophysics, geography, and geodesy.)

INTERNATIONAL CO-OPERATION IN GEODESY AND CARTOGRAPHY. Ing. General G. Laclavere. *Cartography,* Vol. 3, No. 2, September 1959. (Cites numerous examples of cooperation and exchange of information in the two fields.)

AN AERIAL PHOTOGRAPHIC SURVEY OPERATION. A. J. Vial. *Cartography,* Vol. 3, No. 2, September 1959. (Detailed discussion of the fundamentals of aerial photographic survey procedure.)

THE UNITED STATES POWER SQUADRONS. Frederick Franklin. *Navigation,* Vol. 7, No. 1, Spring 1960. (Gives historical background of this widespread organization whose original purpose is "to establish a high standard of skill in the handling and navigation of yachts, to encourage the study of the science of navigation . . ." and to cooperate with agencies of the U. S. Government concerned with those subjects.)

BOWLING GREENS. H. L. P. Dyett. *The New Zealand Surveyor,* Vol. 23, No. 2, Serial No. 218, August 1960. (Describes engineering methods for laying out the playing greens for a sport little known in the United States.)

OPEN SPACE REQUIREMENTS FOR URBAN AREAS. Robert Riddell. *The New Zealand Surveyor,* Vol. 23, No. 2, Serial No. 218, August 1960. (Classifies open space requirements into three groups and discusses methods for providing them.)

MAPS. Walter W. Ristow and Catherine I. Bahn. *The Library of Congress Quarterly Journal of Current Acquisitions,* Vol. 17, No. 4, August 1960. (Annual report of acquisitions of the Map Division.)

KANSAS CITY THRIVES ON ITS EXPRESSWAYS. Joseph F. Wilkinson. *Engineering News-Record,* Vol. 165, No. 12, September 15, 1960. Points up advantages of a well planned freeway system.)

INTERSTATE HIGHWAY CONSTRUCTION CAN MAKE OR BREAK A CITY. Joseph F. Wilkinson. *Engineering News-Record,* Vol. 165, No. 12, September 15, 1960. (Results of a nationwide survey of the results of urban expressway construction as tied in with the Interstate Highway System.)

THE EARLY YEARS OF THE ROYAL SOCIETY. Sir Harold Spencer Jones. *The Journal of the Institute of Navigation,* Vol. 13, No. 4, October 1960. (History of the origins of the Royal Society of London, which celebrated its third centenary in 1960.)

THE RIFT IN THE OCEAN FLOOR. Bruce C. Heezen. *Scientific American,* Vol. 203, No. 4, October 1960. (Continued oceanographic explorations are leading to new concepts of the geology of the ocean floors.)

GRAVITY MEASUREMENTS ON A SURFACE SHIP AT SEA. *IGY Bulletin,* No. 41, November 1960. (Report on measurements of Earth's gravity over water, using a new submarine gravimeter on a stabilized platform aboard the U.S.S. *Compass Island* during a five-week cruise in the Atlantic and Mediterranean seas.)

MISSISSIPPI RIVER COMMISSION. (No byline.) *Marine News,* Vol. 47, No. 5, November 1960. (Brief commentary on the Commission, its establishment in 1879, its first and present membership, and its assigned duties.)

WHY ADOPT THE METRIC SYSTEM. Floyd W. Hough. *Civil Engineering,* Vol. 30, No. 11, November 1960. (Reviews the longstanding controversy over adoption, cites the many arguments for it, and refers to the work of the Committee for the Study of the Metric System appointed in 1958 by the American Geophysical Union.)

AN EXAMINATION OF CIVIL ENGINEERS' COMPENSATION. Oscar S. Bray. *Civil Engineering,* Vol. 30, No. 11, November 1960. (Points up

need for higher compensation to attract higher quality members of the profession.)

THE VOYAGE OF JEAN RICHER TO ACADIA IN 1670: A STUDY IN THE RELATIONS OF SCIENCE AND NAVIGATION UNDER COLBERT. J. W. Olmstead. *Proceedings of the American Philosophical Society*, Vol. 104, No. 6, December 15, 1960. (Historical evaluation of the early work of the Franch Royal Academy of Sciences in astronomy, navigation, and scientific cartography.)

"CRONAR" GROWS UP. (No by-line.) *Du Pont Magazine*, Vol. 54, No. 6, November–December 1960. (Discusses uses of cronar base products, including "Cronaflex" and "Cronapaque," used in cartography and photogrammetry.)

Cartography

EARLY CARTOGRAPHY. Marcel Chicoteau. *Cartography*, Vol. 3, No. 2, September 1959. (Interesting historical notes on some 16th century maps and mapmakers.)

STRIP MASK PROCESS. J. D. Chamberlain. *Cartography*, Vol. 3, No. 2, September 1959. (Presents a reliable method of strip-mask technique for color separations of layering maps.)

XEROGRAPHY AND ELECTROPHOTOGRAPHY—1959. K. A. Metcalfe and R. J. Wright. *Cartography*, Vol. 3, No. 2, September 1959. (Reviews progress made and provides details of an ever-widening group of processes and applications, some of particular interest to cartographers.)

CHARTING THE SEAWAYS. A. Cecil Hampshire. *Nautical Magazine* (London), Vol. 184, No. 2, August 1960. (Summary of the work of the Hydrographic Service of the British Admiralty.)

GEOGRAPHICAL REFLECTIONS ON MODERN MAPPING. D. R. Macgregor. *The Scottish Geographical Magazine*, Vol. 76, No. 2, September 1960. (Describes some of the more important trends in modern mapping and suggests how they may have a bearing on the study of geography.)

JOHN GEORGE BARTHOLOMEW, A CENTENARY. Douglas A. Allen. *The Scottish Geographical Magazine*, Vol. 76, No. 2, September 1960. (Commemorates the centenary of the birth of a member of the famous Bartholomew family of cartographers and map and atlas publishers.)

GREAT CIRCLES AND THE GNOMONIC PROJECTION. C. E. Williams and Merrill K. Ridd. *The Professional Geographer*, Vol. 12, No. 5, September 1960.

REDUCING DISTORTIONS: A USEFUL APPROACH IN AUGMENTING THE UNDERSTANDING OF MAP PROJECTIONS. Howard F. Hirt. *The Journal of Geography*, Vol. 59, No. 7, October 1960.

AGRICULTURAL MAPS IN NATIONAL ATLASES. N. S. Vinogradova in Vestnik Moskovskogo Universiteta, seriya geografiya, No. 1, 1960. *Soviet Geography: Review and Translation* (American Geographical Society), Vol. 1, No. 9, November 1960. (Reviews and describes various types of agricultural distribution maps based on a study of 19 different national and regional atlases.)

GEOMORPHIC MAPPING ABROAD. A. I. Spiridonov in Vestnik Moskovskogo Universiteta, seriya geografiya, No. 1, 1960. *Soviet Geography: Review and Translation* (American Geographical Society), Vol. 1, No. 9, November 1960. (Critical appraisal of various styles of geomorphic maps being produced in countries on both sides of the "iron curtain.")

Control Surveys

PROCEEDINGS OF THE MEETINGS OF THE SECTION OF LEVELLING OF THE INTERNATIONAL ASSOCIATION OF GEODESY. *Bulletin Geodesique*, (Journal of the International Association of Geodesy). Nouvelle Serie, No. 52, 1 Juin 1959. (Entire issue devoted to proceedings, including several papers in English.)

REPORT ABOUT GRAVITY REDUCTION ON THE LEVELLING NETWORK IN BADEN-WURTTEMBERG. K. Ramsayer. *Bulletin Geodesique*, Nouvelle Serie, No. 52, 1 Juin 1959. (Summary of results.)

MAIN SYSTEMATIC ERRORS IN PRECISE LEVELLING. I. I. Entin. *Bulletin Geodesique*, Nouvelle Serie, No. 52, 1 Juin 1959. (Lists errors of observation, vertical displacement of iron baseplates and tripods, thermal effect, and effect of atmospheric refraction.)

ON THE VERTICAL DIFFERENTIAL REFRACTION AND THE INFLUENCE OF TEMPERATURE ON A LEVELLING INSTRUMENT IN SHORT-RANGE OBSERVATIONS. Henryk Strusinsky. *Bulletin Geodesique*, Nouvelle Serie, No. 52, 1 Juin 1959. (Summary of results of experiments conducted by Dr. Strusinsky.)

SOME CONSIDERATIONS ARISING FROM THE RESULTS OF THE SECOND AND THIRD LEVELLINGS OF ENGLAND AND WALES. R. C. A. Edge. *Bulletin Geodesique*, Nouvelle Serie, No. 52, 1 Juin 1959. (Discusses effects of different types of lighting on the readings of engraved and painted staves.)

NOTE ON THE APPLICATION OF MATHEMATICAL STATISTICS TO THE ANALYSIS OF LEVELLING ERRORS. A. M. Wassef. *Bulletin Geodesique*, Nouvelle Serie, No. 52, 1 Juin 1959. (Suggests method of approaching the problem of levelling errors.)

THE LOCALITY OF THE GEODETIC COORDINATE DERIVED FROM THE OBSCURITY OF THE SOLAR ECLIPSE. Takeshi Dambara. *Bulletin of the Geographical Survey Institute* (Japan), Vol. 6,

Part 1, March 1960. (Mathematical demonstration.)

SEMI-GRAPHIC DETERMINATION OF THE INTERSECTION OF MULTIPLE RAYS OF MEASURED LENGTHS. Prof. G. J. Thornton-Smith. *The Australian Surveyor,* Vol. 18, No. 2, June 1960. (Offers solution to the problem of finding the most probable value of the projection grid coordinates of a point to which distances are measured from a number of stations whose coordinates are known.)

THE THEORY AND APPLICATION OF EXTERNAL CONDITION EQUATIONS IN TRILATERAL ADJUSTMENT. B. T. Murphy. *The Australian Surveyor,* Vol. 18, No. 2, June 1960. (Introduces a method of adjusting a trilateration net for the purpose of inducing an exact closure in azimuth, latitude, and longitude at fixed control points by the method of least squares.)

ETHIOPIAN SURVEY OPERATIONS. Rear Admiral H. Arnold Karo. *The Military Engineer,* Vol. 52, No. 348, July–August 1960. (Describes progress in establishing geodetic control in the upper Blue Nile basin.)

NOTES ON A TRIANGULATION SURVEY CARRIED OUT IN THE WAITAKI VALLEY FOR CONTROL OF PHOTOGRAMMETRY. J. B. Mackie. *The New Zealand Surveyor,* Vol. 23, No. 2, Serial No. 218, August 1960. (Text indicates how fieldwork was done, describes an easily portable observing beacon, and discusses adjustment and accuracy of results.)

SIMULTANEOUS ADJUSTMENT OF ANGULAR AND DISTANCE MEASUREMENTS. Frederick F. Ceeley, Jr. *Journal of Geophysical Research,* Vol. 65, No. 9, September 1960. (Presents method of adjusting triangulation, trilateration, and traverse simultaneously.)

HORIZONTAL MOVEMENT IN THE EARTH'S CRUST. C. A. Whitten. *Journal of Geophysical Research,* Vol. 65, No. 9, September 1960. (Presents new method of analysis of reobservations of a triangulation network to indicate small displacements along a fault line, illustrated by measurements along the San Andreas fault.)

HIRAN GEODESY AND PHOTOGRAPHIC OBSERVATIONS. Alexander Corpacius. *Journal of Geophysical Research,* Vol. 65, No. 9, September 1960. (New formulas are developed for computing the azimuth and distance between two Hiran ground stations with data obtained from photographs to obtain a method for determining the orienation of a Hiran network.)

THE LATEST ACHIEVEMENTS OF PHYSICAL GEODESY. W. A. Heiskanen. *Journal of Geophysical Research,* Vol. 65, No. 9, September 1960. (Affirms that the accuracy of computing the undulations in the geoid is not yet as high as is desired is not due to the method itself but to the lack of gravity data.)

THE WITWATERSRAND GOLDFIELDS SYSTEM OF TRIANGULATION. Prof. G. B. Lauf. *The Journal of the Institute of Mine Surveyors of South Africa,* Vol. 11, No. 3, September 1960. (Historical background and account of the execution of a famous survey.)

THE APPLICATION OF ELECTRONIC COMPUTERS TO SURVEY PROBLEMS. H. E. C. Beer. *The Australian Surveyor,* Vol. 18, No. 3, September 1960. (Defines the most common terms in computer language and describes various operations.)

GEODESY BY OPTICS AND ELECTRONICS. Andrew C. Campbell. *The Military Engineer,* Vol. 52, No. 349, September–October 1960. (Account of a Navy Hydrographic Office project of distance measurement in the vicinity of Midway Islands, using an electronic distance measuring device and theodolites simultaneously.)

PRECISE TELLUROMETER TRAVERSING. Major A. G. Bomford. *Empire Survey Review,* Vol. 15, No. 118, October 1960. (Concluded from previous issue.)

BAROMETRIC DETERMINATION OF ELEVATION. G. U. Wilson. *Empire Survey Review,* Vol. 15, No. 118, October 1960. (Discusses the meteorological principles involved in barometric surveying.)

MICROCLIMATOLOGY AND ITS EFFECTS ON THE ACCURACY OF SURVEYING MEASUREMENTS. Desmond O'Connor. *Empire Survey Review,* Vol. 15, No. 118, October 1960. (Reviews various climatological and meteorological factors affecting observations and measurements.)

A COMMENTARY ON GOUSSINSKY'S TABLES. Prof. G. H. Menzies. *Empire Survey Review,* Vol. 15, No. 118, October 1960. (Complex mathematical discussion.)

THE USE OF CONCLUDED LENGTHS IN TRILATERATION ADJUSTMENT. B. T. Murphy. *Empire Survey Review,* Vol. 15, No. 118, October 1960. (Presents a method of adjusting a trilateration net in which a redundancy exists and in which one of the primary figures formed by the major sides is not a triangle.)

A GRAPHICAL METHOD OF SELECTING STARS FOR ASTRONOMICAL OBSERVATIONS. D. GADD. *Empire Survey Review,* Vol. 15, No. 118, October 1960. (Describes method for selecting stars with suitable altitudes and azimuths from standard star almanacs by their right ascensions and declinations.)

Education

TRAINING FOR PROFESSIONAL RESPONSIBILITY. A. N. Mercer. *The Australian Surveyor,* Vol. 18, No. 3, September 1960. (Deplores decline of prestige in surveying profession in Australia and cites need for continuing steps to improve educational standards.)

THE CIVIL ENGINEER'S CIVIC RESPONSIBILITY. John E. Wright. *Civil Engineering*, Vol. 30, No. 9, September 1960. (The paper which won the Daniel V. Terrell Award at the annual meeting of the ASCE District 9 Council in Columbus, Ohio, in April 1960).

EDUCATIONAL ACTIVITIES OF WASHINGTON SCIENTISTS. John K. Taylor. *Journal of the Washington Academy of Sciences*, Vol. 50, No. 6, October 1960. (Describes programs of the Joint Board on Science Education for the Greater Washington Area.)

Instruments

AN EVALUATION OF THE S. O. M. STEREOFLEX AS A THIRD ORDER PLOTTING INSTRUMENT. B. F. Plummer. *Cartography*, Vol. 3, No. 2, September 1959. (Illustrated description of the instrument and an analysis of its performance.)

FIFTEEN YEARS OF MARINE RADAR. Captain F. J. Wylie. *The Journal of the Institute of Navigation*, Vol. 13, No. 4, October 1960. (Comprehensive survey of all the main trends of development in commercial marine radar since it first went to sea in 1956.)

Property Surveys

A REVIEW OF THE TORRENS SYSTEM AND SOME ASPECTS OF TITLE SURVEY. F. W. Arter. *The Australian Surveyor*, Vol. 18, No. 2, June 1960. (Paper given at the 1960 Conference of the Institution of Surveyors, Australia.)

THE CADASTRAL SURVEY OF TONGA. D. L. Leach. *The New Zealand Surveyor*, Vol. 23, No. 2, Serial No. 218, August 1960. (Description of a new survey with an account of the historical background, the system of land tenure, and the nature of the area.)

ELECTRONIC DISTANCE MEASUREMENT OVER SHORT LINES. F. H. Edwards. *The Australian Surveyor*, Vol. 18, No. 3, September 1960. (Analyzes results of Geodimeter and Tellurometer measurements on property and other short lines.)

PHOTOGRAMMETRIC TECHNIQUES IN LAND TITLE BOUNDARY SURVEYS. G. C. Irving. *The Australian Surveyor*, Vol. 18, No. 3, September 1960. (Discusses application of photogrammetry to various problems of cadastral surveys.)

SOME STATUTORY ASPECTS IN CADASTRAL USE OF PHOTOGRAMMETRY. G. S. Andrews. *The Canadian Surveyor*, Vol. 14, No. 5, November 1960. (Discussion of the problem, illustrated by the statutes of British Columbia and the regulations thereunder.)

THE NEED FOR A CO-ORDINATE SYSTEM OF SURVEY CONTROL AND TITLE REGISTRATION IN NEW BRUNSWICK. W. F. Roberts. *The Canadian Surveyor*, Vol. 14, No. 5, November 1960. (Discusses problem of ten thousand miles of property boundary separating blocs of crown lands totalling some seven million acres in blocks surrounded by freehold properties.)

THE LAW AND THE SURVEYOR. W. Marsh Magwood. *The Canadian Surveyor*, Vol. 14, No. 5, November 1960. (Series of lectures under the titles: "The Effect on Retracement of Land Titles and Registry Systems," "Scope and Function of a Surveyor," "Evidence," "Aliquot Parts in Ontario," and "Boundaries.")

SHOULDN'T ENGINEERS APPRAISE LAND? B. Prussiano. *Journal, Florida Engineering Society*, Vol. 14, No. 4, December 1960. (Believes property appraisal is a proper function of the trained engineer.)

BOOKS AND PAMPHLETS

SURVEY OF KENYA, ADMINISTRATIVE REPORT, 1959. Government Printer, Nairobi, 1960. 19 pp.

HOW TO OBTAIN ARMY MAPS. U. S. Army Map Service, Washington, 1960. 12 pp., maps. (AMS Key No. 204740.)

DESIGN OF SMALL DAMS. U. S. Bureau of Reclamation. Washington, GPO, 1960. 611 pp., maps.

ELEMENTARY MAP INTERPRETATION: BASED ON MAPS OF NIGERIA, GHANA, AND SIERRA LEONE. J. H. Jennings. *Cambridge University Press*. Paper, 62 pp., illus., $1.50.

REPORT OF THE SECOND MEETING OF THE COMITE INTERNATIONAL DE GEOPHYSIQUE. International Union of Geodesy and Geophysics. Institut Geographique National, Paris, 1960. 44 pp.

THE FINNISH GEODETIC RESEARCH. Dr. W. A. Heiskanen. Mikkelisa 1960. Oy, Lansi-Savon Kirjapaino Suomi-Finland. 23 pp., maps, illus.

THE STATE OF TEXAS REGISTERED PUBLIC SURVEYORS ROSTER, 5TH, JULY 1960. State Board of Registration for Public Surveyors, Austin. 57 pp.

NEW JERSEY, ROSTER, LICENSED PROFESSIONAL ENGINEERS AND LAND SURVEYORS, June 30, 1959. State Board of Professional Engineers and Land Surveyors, Department of Law and Public Safety, Newark. 155 pp.

COLLECTIVE OBSERVATIONS IN THEORY AND PRACTICE. B. Goussinsky. The Survey of Israel, Tel Aviv, 1960. 26 pp., 2 plates, processed.

MAP MAKING: THE ART THAT BECAME A

SCIENCE. Lloyd A. Brown. *Little, Brown and Co.*, Boston, 1960. 217 pp., maps.

SURVEYING OUR PUBLIC LANDS. U. S. Government Printing Office, 1960. 16 pp., illus., 10 cents. (Catalog No. I 53.2:P96/7.)

RADIO AIDS TO MARITIME NAVIGATION AND HYDROGRAPHY (OPERATIONAL REPORTS). Supplement to the *International Hydrographic Review*, Vol. 1, October 1960, Monaco. 148 pp., illus., maps bibliography.

—LYMAN D. LYNN

Coast and Geodetic Survey

All About Graduate School

A student's-eye view of how to get into—and through—graduate school has just been published by the American Society for Engineering Education. Graduate study is becoming more important in engineering. Not every engineering student should take graduate study, but he should consider the possibility. "The Road to Graduate School" will give him the data to consider that possibility intelligently.

The new publication tells the engineering undergraduate about graduate study and the life of the graduate student. It was published by the ASEE's Committee on the Development of Engineering Faculties. Publication was supported by the Ford Foundation. The new booklet gives the undergraduate a clear, objective picture of what graduate study is like, what its goals are, and what it requires of the student.

"The Road to Graduate School" was prepared by students in the University of Illinois chapter of Tau Beta Pi, engineering honorary society, and has the student's approach throughout. The aim of the authors was to give information that would apply to graduate study at any accredited engineering school in the United States.

The booklet is being distributed through engineering deans and individual chapters of Tau Beta Pi. It is available free to all undergraduate engineering students.

Illustrated by five photographs and four cartoons on graduate student life, "The Road" presents twenty pages of the most essential information for planning graduate study, including the reasons for taking graduate work, the kinds of degrees available, and the life of the graduate student. One section deals with what graduate study requires of the student, and another tells how to go about choosing the right school for the individual student's needs. The section telling "when and where to apply for what" is followed by a calendar for applications and inquiries that should help the prospective graduate student meet all the necessary deadlines.

For the married student there is a section on married housing, jobs for the wife, and similar problems that he may have to solve.

A detailed section on financial support outlines the types of support available and the advantages and disadvantages of each. This section makes the point that the engineer who is qualified for graduate study should have no trouble getting financial assistance if he needs it.

A "Bibliography for the Prospective Graduate Student" is the last section of the booklet. It provides an annotated list of references for the undergraduate who wants more information about graduate schools, financial aid, and other aspects of graduate study.

The entire booklet is what its title suggests—a brief, direct, inclusive map for the road to and through that interesting region, graduate school.

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Distinctive Recent Maps

Domestic Agricultural Migrants in the United States is a 1960 cartographic publication of the U. S. Public Health Service. The map, which spotlights counties estimated to have 100 or more migrants at the peak of the normal crop season, was prepared to assist public health and other service agencies to identify areas of migrant labor concentration. It measures 26 by 40 inches. Copies of the map are available from State health departments and employment security agencies, and from the Public Health Service and the Children's Bureau, U. S. Department of Health, Education and Welfare, Washington 25, D. C.

The Mississippi Valley Association (St. Louis, Mo.), published in 1960 a *Water Resources Projects Map of the United States.* The map, which measures 21 by 34 inches and is at the scale of 1:5,750,000, shows existing navigation and flood control projects, local protection features, and channel and miscellaneous improvements. There are inset maps of Alaska, Hawaii, the Pacific Islands, the Canal Zone, and Puerto Rico.

Commemoration of the centennial of the War Between the States provides an incentive to cartographers and illustrators. Peyton Greaves, of Albany, Georgia, copyrighted in 1960 *The Confederate States of America, 1861 to 1865, An Historical Map Showing the Battles in Their Historic Struggle for Independence.* It is printed in black ink on a parchment-like paper and is decorated with ships, railway trains, steamboats, and cannon. It is 22 by 34 inches in size.

Major Battlefields in Virginia in the War Between the States is a presentation of the Joseph W. Bliley Company of Richmond, Virginia. It is a colorful pictorial map measuring approximately 16 by 20 inches. Small sketches of battle scenes decorate the borders.

Mineral Resources and Mineral Industries of Tennessee is a 1959 publication of the Division of Geology, [State of Tennessee] Department of Conservation and Commerce. It was compiled by William D. Hardemann and Robert A. Miller, with the assistance of Stuart W. Maher and Robert E. Hershey. Nonmetallic and metallic mineral deposits are located on the map, and described in brief notes at the bottom of the map sheet. The scale is 1:500,000 and the dimensions are 39 by 64 inches.

Shreveport, Louisiana, is number 51 in the U. S. Geological Survey's series of city and vicinity maps. The six-color map is at the scale of 1:24,000 and combines four 7½-minute quadrangles—North Highlands, Bossier City, Shreveport East, and Shreveport West. The Shreveport and Vicinity map may be purchased, for $1.50, from the U. S. Geological Survey, Washington 25, D. C., or Denver 25, Colorado.

Hoffman & Walker, Houston 23, Texas, are the publishers of an attractive *Pictorial-Historical Map of Texas.* It is at the scale of one inch to 20 miles, and measures 43 by 45 inches. Some 35 illustrations and more than 150 brief notes, on the face of the map, feature the ante-bellum history of the State.

A detailed and attractive *Reconnaissance Topographic Map [of] Mount McKinley, Alaska,* was published, in 1960, by the Museum of Science, Boston, Massachusetts. It was surveyed and edited by Bradford Washburn "under the auspices of The Museum of Science, Boston, Massachusetts, U. S. A.; The Swiss Foundation for Alpine Research, Zurich, Switzerland; The American Academy of Arts and Sciences, and the late Dr. Alexander Hamilton Rice." The map is printed, in the expressive and colorful Swiss cartographic style, by The Swiss Federal Institute of Topography, Bern-Wabern, Switzerland. It is at the scale of 1:50,000 and measures 31 by 30 inches. Glaciation conditions of 1951 are depicted.

The Canadian-American International Joint Commission has issued an attractive and colorful map of the Columbia River Basin at the scale of 1:500,000. It was prepared by the U. S. Geological Survey and shows, in graphic relief shading, the generalized topography of this rugged mountainous region. The map sheet measures 38 by 34 inches.

Two maps of the "European Community" compiled by I. B. F. Kormoss, Expert attaché au Collège d'Europe, are recent accessions. Both are at the scale of 1:4,000,000 and were printed by the Institut Géographique Militaire, Bruxelles. *Densité de la Population des Pays Membres des Communautés Européennes de la Swisse et de l'Autriche Occidentale* shows five classes of population density, ranging from more than 500 inhabitants per kilomètre to less than 25 inhabitants per kilomètre.

The second map is entitled *Les Sources d'Énergie des Pays Membres des Communautés Européennes de la Swisse et de l'Autriche Occidentale.* On a generalized relief base are shown deposits of the several energy minerals, pipe lines, proc-

essing centers, and hydroelectric regions. Both maps are 23 by 20½ inches in size.

The Ordnance Survey Office, Dublin, published in 1960 a map of *Monastic Ireland* at the scale of 1:625,000. On the map, which measures 31½ by 26 inches, "an attempt has been made to express the geographic distribution and the character of the religious houses from the time of St. Patrick, in the fifth century, to the end of the sixteenth century." The map was compiled by R. Neville Hadcock, with the advice and help of a large number of collaborators. It is accompanied by a 25-page booklet with descriptive text and index.

Scotland of Old, compiled by Sir Iain Moncreiffe and Don Pottinger, shows the lands and spheres of influence of the main clans and names of Scotland, about the time of King James VI, together with their main seats, strongholds, and historic sites. The borders of the map are colorfully decorated with the arms and crests of the chiefs of the ancient families. Publisher is John Bartholomew & Son, Ltd., of Edinburgh. The map is 40 by 30 inches and comes folded in an attractive envelope. The price is five shillings.

Several recently-published maps present aspects of the cultural and economic landscape of France. *Les Grandes Zones de Cultures* and *Forêts-Élevage et Pêche* are both 1960 publications of the Direction de la Documentation, 14–16, Rue Lord-Byron, Paris 8e, France. The former, differentiates some ten types of rural land utilization. Forest, grazing, and fishing areas are featured on the latter. Both maps were compiled by Charles Guy, with cartography by G. Lafosse. They are at the scale of 1:1,700,000 and measure 25 by 28 inches.

Fishing in France was published in 1959 by that nation's Commissariat Général au Tourisme and the Ministère de l'Agriculture. It shows public waterways, private waterways, canals, dams, oceangraphic museum, and fish-breeding establishments, in addition to locating the principal habitats of some twenty varieties of saltwater fish. Descriptive and illustrative data occupy the verso of the map sheet.

Carta dei Suoli D'Italia (Soil Map of Italy) shows the major soil associations of that country. The map, at the scale of 1:1,500,000, was compiled by Fiorenzo Mancini and published, in 1960, by Litografia Artistica Cartografica, Firenze, Italy. It measures 34 by 28 inches.

Road Map of Iran, at the scale of 1:4,000,000 is a 1960 publication of A. Sahab Geographical and Drafting Institute, P. O. Box 236, Tehran, Iran. Railways, airways, and waterways are shown in addition to highways. The map sheet, which measures 19 by 31 inches, includes a small-scale relief map of Iran, and a road-distance chart.

The same publisher has also issued a map of *Afghanistan* showing political subdivisions, physical conditions, roads, distances, and historical monuments. The scale is 1:2,000,000 and the dimensions are 24 by 23 inches.

Carte de Sols du Congo Belge et du Ruanda-Urundi maps the soil distribution. It is at the scale of 1:5,000,000 and measures 29 by 19 inches. Five major soil groups and more than thirty subgroups are identified. The map, with an accompanying descriptive booklet, is the work of Mr. C. Sys, of the Division d'Arologie, Institut National pour l'Etude Agronomique du Congo Belge, Bruxelles.

Carte Forestiére de Madagascar shows the distribution of forests on that large island. It was compiled in the Ministère de l'Agriculture, and published by le Service Géographique de Madagacsar in 1959. The map is at the scale of 1:1,000,000, and is printed on three sheets, each measuring 28 by 41 inches. There are insets of the islands of Maurice and La Réunion at the scale of 1:500,000.

The *Soil Map of New Zealand* is at the scale of four miles to an inch and comprises 8 sheets, each approximately 30 by 33 inches. It was prepared by the [New Zealand] Department of Scientific and Industrial Research, with basal data supplied by several other Federal agencies.

A two-sheet map of New Zealand charts the water depths around the two large islands comprising that Dominion. It was compiled by the Oceanographic Institute, Wellington, and published, in 1960, by the Department of Scientific and Industrial Research. The map was prepared to accompany New Zealand Oceanographic Institute Memoir No. 11. Each sheet measures 30 by 40 inches and the scale is 1:2,191,400.

—WALTER W. RISTOW

Library of Congress

Report on Scribing

Published in October 1960, the Aeronautical Chart and Information Center's section of Part II is now available for distribution. Requests for copies of this increment of Part II, *Report on Scribing,* should be addressed to the Aeronautical Chart and Information Center, 2nd & Arsenal Streets, St. Louis 18, Missouri.

See SURVEYING AND MAPPING, December 1960, Vol. XX. No. 4, page 541.

The Surveyor and the Law

Texas Law

While at the recent Texas Surveyors Association annual meeting and the ACSM Regional Conference, several impressions of Texas law were gained.

In early Texas law (Stafford *v* King, year 1867, 30 Tex 257) the Hon. George W. Smith wrote, ". . . course and distance are regarded as the most unreliable and generally distance more than course, for the reason that chain-carriers may miscount and report distances inaccurately, by mistake or design. At any rate, they are more liable to err than the compass." And such is the Texas law today. In instructions to the jury the judge states, in suitable court language, "If you are to choose between bearing and distance, bearing is to be considered more certain."

Other than in Texas everyone has parroted the court ruling "distance is more certain than direction." But is it?

In double proportioning (confined almost exclusively to sectionalized lands wherein some corners, when lost, are replaced by double proportion) we must admit that direction is relegated to lesser importance. Within checkerboard subdivisions, block corners could be re-established by double proportion from four found original monuments, but as yet I have not seen it done. Most surveyors use the intersection of straight lines (direction more important).

This poses a question, "Can anyone, other than in double proportioning, think of a situation wherein direction and distance would be in conflict with one another?" If they cannot be in conflict, the argument of which is more important, distance or direction, reduces itself to "which came first, the hen or the egg?" A straight line can be defined in many ways. Essentially they are all variations of (1) defined by monuments and (2) defined by distance and direction (vector quantities). If a line is defined by calling for monuments (along James' land, to an iron pipe, to the ocean, etc.) the monument controls and whatever is in conflict with the call for the monument yields. Bearing and distance are both subordinate, hence neither controls over the other.

Two situations, in calls for monuments, arise wherein it appears bearing or distance must yield to the other. A call of "North 600 feet to the ocean" goes "North to the ocean whether it is 600 feet or not." A call of "East 100 feet along Main Street" goes "East 100 feet along Main Street whether Main Street is East or N 89° 58′ E". In the first instance, it appears that direction is superior to distance; in the second it appears that distance is superior to direction. Actually distance and direction are not in conflict with one another in either case; each is in conflict with a call for a monument. In the first instance 600 feet yields to the call for the ocean, not the call for a bearing. In the second instance the bearing yields to the call for the street line, not the call for a distance.

Vector lines, defined by direction and distance, must have both recited, otherwise the line cannot be located. In such a case, how can bearing be in conflict with distance? What difference does it make if one is said to be superior to the other? As I see it, if the rule of direction being more important than distance is strictly adhered to in Texas, the only difference will be that double proportioning cannot be used. And I don't believe it is. Who in Texas can answer this?

In alienating land the State of Texas, in general, gave or sold the right to acquire a parcel of land. Land was often surveyed, one piece at a time, as the need arose. In sectionalized land areas parcels were presurveyed prior to land offerings and parcels were acquired in conformity with the survey. In Texas the land was selected and then surveyed. In Texas this created a sequence of sales with senior rights attaching to other parcels. The problem of senior rights is not unique to Texas; all other States have it. The only difference is that Texas has *more* of it. And, from the size of Texas, they have many more parcels in which this can happen.

Discovery of oil has had a marked influence on the surveyor's status. The value of land in an oil field and the monetary value of every foot of land gained has created a demand for first-grade, top-quality professional surveyors. Oil field

surveys often have to be proven in court, and the surveyor who does poor work is in an embarrassing position. After listening and talking to the better surveyors, there is no question in my mind that the better Texas surveyors are among the best.

Public surveyors in Texas were recently registered. The usual problem of the unqualified, grandfathered-in as surveyors, could be discerned. In California that problem has been largely solved by time; thirty years later few unqualified "grandfathers" have survived.

—Curtis M. Brown

From R. D. Comstock, Registered Engineer and Surveyor, Florida, via Charles A. Whitten and H. Paul Kaufman, comes this question,

"After 49 years of active work in surveying and property improvement I am retiring from practice, and in this connection a question has arisen which is of interest not only to myself but other local surveyors.

"Many of us have carried Errors and Omissions Insurance and the question arises as to the length of time a surveyor is responsible for his work. Is there a statute of limitations for professional men such as surveyors and engineers?"

My own inquiries on this subject are limited to California, but I am sure many of the remarks will be applicable in other places. We must concede that every State has its own regulations and you are bound by them.

(1) Practically all liability items have a statute of limitations.

(2) In California, as in many other States, the statute of limitations with respect to surveys is a given number of years after the discovery of an error.

I think this makes you "forever" liable—that is until death. But another law does give some relief. In California the statute of limitations or occupancy is five years. A person putting up a fence, a building, or the like cannot be ousted once the improvement has been in existence for five years. But if the improvement is removed prior to adverse occupancy rights ripening into a fee title, any new structure must go on the correct line. In effect this means liability is present for five years after improvements are erected.

Also, there is some relief when the property is sold by the client. Although in some States professional men have been held liable for third party actions (the person not paying the fee), it is not universally true. In California real estate has moved so fast that in five years there may be ten new owners. In such a situation the first surveyor would probably be out of the picture.

Most liability insurance covers only "claims arising during the time that the premium is in force." An additional fee is needed to cover cases resulting from surveys made prior to the effective date of the policy. If a person is to stay protected after retirement, he must carry insurance for a period of years after closing shop. In California five years may be adequate. This is a good question to take up with your liability insurance company.

One mode of backsight relief is to practice as a corporation. Here the surveyor is an employee. But I despise the corporation, since the non-register can hide behind the skirts of a corporation and effectively have a surveying practice. If a corporation has 100 percent of its stockholders as registered men, I see no problems, but as yet this is not a requirement in most States.

Perhaps, surveyors from other States would like to comment on this. —Curtis M. Brown

Photograph Those Boundary Corners

After the property corner has been located, restored or set, a photograph, taken with an inexpensive camera, will provide a great deal of additional information in the future. Contact prints that are filed with the field notes or the plats, will show the location well enough for easy recovery. The pictures, when shown to oldtimers, may serve to uncover additional evidence relative to the property line.

The owner will always appreciate having prints of the pictures and will be more alert to prevent damage to the monuments. Questions, such as on which side of the fence the corner is found and how far from the building the crosscut is located, can usually be answered by the photographs.

If a 35-mm. camera is used with black-and-white film, the cost will amount to only about 20 cents a photo. This is but a small price to pay for the splendid service that will be rendered.

The Illinois Surveyor

Original Terminus Marker of Pennsylvania-West Virginia State Line To be Restored [1]

The new site of the southern terminal monument of the Pennsylvania-Ohio State Line—recently relocated and rededicated as a reference mark to the "point of beginning" of the United States surveys of the western public lands, at East Liverpool, Ohio[2]—and the location, on the opposite side of the Ohio River, of the northern terminal marker of the Pennsylvania-West Virginia line were inspected Tuesday, November 29, 1960, by A. G. Reese, Director, Pennsylvania Bureau of Land Records.

Earlier in 1960, the 1785 stone marker constituting the northern terminal monument of the Pennsylvania-West Virginia line was found along the bank of the Ohio River near Little Blue Run, some distance from the point where it was originally placed. The original marker was found by Richard S. Thompson and Gale Clutter, members of the Aboriginal Explorers Club, and plans have been made to return it to its original location.

[1] Based on information contained in the November 30, 1960, issue of the *East Liverpool Review*. East Liverpool, Ohio.

[2] *See* SURVEYING AND MAPPING, June 1960, Vol. XX, No. 2, pages 229–232, and December 1960, Vol. XX, No. 4, pages 475–482.

The Knack of Not Talking

EDITOR'S NOTE.—The following, credited to *The Little Gazette*, was found under the above title in *The New Age* for December 1960. There is food for thought therein.

Tranquility seems to be going the way of the whooping crane. Whooping talkers are to blame. People talk, not so much because they want to, but simply because they haven't the moral stamina to keep quiet. The result is, in our friendly social relationships we encounter fewer and fewer oases of silence. Soul-healing is harder and harder to come by.

Somehow it has become impolite *not* to talk. Why would it not be more kind to indulge those around you with pleasant intervals when they can be near you and yet not have to listen? There would be a number of advantages. Your thoughts would have time to catch up with your tongue; your ignorance could be concealed that much longer; and when you *did* talk there would always be—for your listeners—the intriguing possibility that you might have something to say that they would be interested in hearing.

Once you get the hang of keeping your mouth shut you will wonder why you haven't tried it before. And you will appreciate what Calvin Coolidge meant when he broke his silence long enough to declare, "I never have been hurt by anything I didn't say." —*The Little Gazette*

Giant Book

The Department of Mines and Technical Surveys, Ottawa, Canada, has published a 30-page brochure, with an 8 x 10 page size, which has on the front cover a picture of a woman who is apparently reading from a book that is about two feet taller than she is. Then, on the inside of the front cover, we found this note: "This pamphlet is reproduced from a seven-foot-high display book which depicts the activities of the Department of Mines and Technical Surveys, Ottawa, and which is being exhibited across Canada for the information of the interested public."

Well, that explained the striking picture on the cover, and we went on to find that the pages of the book are divided into two columns—English in the lefthand column and French in the righthand column. The various activities of the Department are set forth in two languages, and the captions of the illustrations are given in both English and French.

If the original book is seven feet tall and the pamphlet is 10 inches tall, it would appear that the pamphlet has been brought out at a scale of 1:8.4, and that's "large scale." Text in the original giant book must have been set in about 72-point type which should make it readable, even for us oldsters whose arms are not quite long enough for reading newspapers conveniently.

Books in Review

ELEMENTS OF PHOTOGRAMMETRY. Wilfred H. Baker. *The Ronald Press Company,* New York, 1960. 199 pp., 140 illustrations. $5.00.

The basic concepts of photogrammetric mapping are presented in this book. It will be especially useful as a text for instructors of photogrammetry at the introductory level for college students.

The geometry of vertical, oblique, and terrestrial photography is covered without making use of the more complicated plotting equipment. Mosaics, interpretation, radial-line plotting, and current applications of photogrammetry in mapping are included topics. The insertion of written problems and suggested laboratory problems will be welcomed by the photogrammetry instructor who uses this text. —C. E. COOK

PHOTOGRAMMETRY AND PHOTO-INTERPRETATION. Stephen H. Spurr. *The Ronald Press Company,* New York, 1960. 472 pp., 151 illustrations. $12.00.

This new edition of the author's "Aerial Photographs in Forestry" (1948) is almost a completely new book. The first part is devoted to the fundamentals of photogrammetry. A comprehensive resume of new techniques and equipment is included.

The second part of the book deals with photo-interpretation in general and forestry applications in particular. The forestry applications cover the use of aerial photographs in forests, measurement of trees in stands, diameter and volume, forest surveys, controlling ground inventories, and forest measurement.

In addition to the thorough coverage of the various subjects, the references and documentation are excellent. The organization of material and the presentation are worthy of commendation. This book is a welcome addition to the literature on photogrammetry and photointerpretation. —C. E. COOK

CURVE SURVEYING. R. B. M. Jenkins. *Cleaver-Hume Press, Ltd.,* London, 1960. 184 pp. 35 shillings.

Curve Surveying is a lucidly written book, particularly useful to the field engineer responsible for staking curves combined with transition curves for railroads and for highways.

Practical problems are given, supported by development of applicable equations for solution of general and special curve problems, including a single curve joining separate tangents, compound curves, and reversed curves.

Three separate types of transition curves are given for attaining the change in direction and the proportionate change in superelevation from tangent to circular curve and between circular curves of differing degree (length of radius) curving in the same direction. These transition curves are The Cubic Parabola, The Clothoid, and The Lemniscate.

There is a final chapter on the realinement of railway curves by use of measured middle ordinates, where rails have shifted from their initially constructed position, to achieve a uniform transition from tangent to circular curve, uniform circular curve, and transition from circular curve to forward tangent.

From the highway engineer's point of view, the book contains a practical approach to many computation problems but lacks sufficient supporting tables for ease in accurate computation of the essential parts of the circular curve and spiral transition curves. —WILLIAM T. PRYOR

BOOK NOTES

GURLEY EPHEMERIS 1961. W. & L. E. Gurley, Troy, N. Y. Paper cover, 3¾ × 6½, illustrated, 92 pages + folded chart.

The 1961 edition of the Gurley Ephemeris is now available for distribution to teachers, students, and practitioners of surveying. This publication is so well known that it seems unnecessary to describe it in detail.

SCIENTIFIC RESOURCES OF THE SAN FRANCISCO BAY AREA (3rd. Edition). International Science Foundation.

This handbook, compiled and edited for the International Science Foundation by Cooperative Research Institute, contains chapters covering the following: universities and college, with information on current research in their various departments; scientific institutions such as museums and foundations, giving a summary of their research activities; engineering and scientific societies having headquarters or branches in the Bay Area, giving addresses, officers, activities, etc.; consulting engineers; industrial research facilities, describing the research being carried on by the area's industrial organizations; Bay Area trade associations engaged in research; Federal, State, county, and municipal agencies concerned with scientific research; and scientific and technical periodicals originating in the Bay Area.

Copies are available at $5.00 each from International Science Foundation, World Trade Center, San Francisco 11, California.

FILM DISTORTION COMPENSATION FOR PHOTOGRAMMETRIC USE. G. C. Tewinkel. Coast and Geodetic Survey Technical Bulletin No. 14, September 1960. Paper cover, 8 × 10, 5 pages, illustrated. Superintendent of Documents, Government Printing Office, Washington 25, D. C., $0.10.

This bulletin exhibits the results of certain studies of irregular film distortion and provides methods of compensating for such distortion in photogrammetric work.

A SINGULAR GEODETIC SURVEY. Lansing G. Simmons. Coast and Geodetic Survey Technical Bulletin No. 13, September 1960. Paper cover, 8 × 10, 14 pages, illustrated. Superintendent of Documents, Government Printing Office, Washington 25, D. C., $0.15.

A detailed statement concerning the problems involved, equipment and methods used, and results obtained in the unusual triangulation project in the vicinity of Cape Canaveral, Fla., mentioned in SURVEYING AND MAPPING, December 1960, Vol. XX, No. 4, page 506, under the title "Better Than 'One in a Million'."

A GUIDE TO HISTORICAL CARTOGRAPHY—A SELECTED, ANNOTATED LIST OF REFERENCES ON THE HISTORY OF MAPS AND MAP MAKING—Second Edition, Revised. Compiled by Walter W. Ristow and Clara E. LeGear. Map Division, Reference Department, Library of Congress, Washington 1960. Paper cover, 8 × 10½, processed, 22 pages. Free to libraries and other institutions upon request to the Publications Unit, Library of Congress, Washington 25, D. C.

This publication contains 67 annotated references pertaining to the history of maps and mapmaking, arranged alphabetically by name of author. A four-page classified index will assist the user to locate material in any particular classification quite readily. Library of Congress call number is given with each item, and the annotations call attention to the outstanding features of the various works.

PLANE COORDINATE INTERSECTION TABLES (2½-MINUTE)—IDAHO. Coast and Geodetic Survey, Publication 65–1, Part 10, 8 × 10, paper cover, iv + 172 pages. Available from Superintendent of Documents, Government Printing Office, Washington 25, D. C. $1.00.

PLANE COORDINATE INTERSECTION TABLES (2½-MINUTE)—IOWA. Coast and Geodetic Survey, Publication 65–1, Part 13, 8 × 10, paper cover, iii + 91 pages. Available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 50 cents per copy.

The tables in these publications contain the plane coordinates for 2½-minute intersections of meridians and parallels within the limits of the States. These plane coordinates are based on the State plane-coordinate systems established by the U. S. Coast and Geodetic Survey. The tables are arranged by 12½-minute bands of latitude with the full range of longitude of the Zone, followed by the coordinates for the next higher band of latitude. The tables are also arranged by Zone.

ORIGINAL INSTRUCTIONS GOVERNING PUBLIC LAND SURVEYS, 1815–1855—A GUIDE TO THEIR USE IN RESURVEYS OF PUBLIC LANDS. Edited and Published by the late J. S. Dodds (Past President, ACSM). The general edition, for use in all Public Lands States, is available at $5.25 postpaid from Mrs. J. S. Dodds, 213 8th St., Ames, Iowa.

In his preface, Professor Dodds stated, "It should be noted that the 1855 instructions were standard for the great body of U. S. Surveys for about fifty years. For surveys made at any time from 1855 to 1900 the 1855 instructions are a valuable handbook for any practicing surveyor on retracement of original surveys."

This book was also published in an Iowa edition, which, in addition to the material published in the general edition, contains material relating solely to Iowa and its boundaries.

REPORT OF THE 45TH NATIONAL CONFERENCE ON WEIGHTS AND MEASURES 1960. Bureau of Standards Miscellaneous Publication 235, issued December 16, 1960, 158 pages, $0.75. Order from Superintendent of Documents, Government Printing Office, Washington 25, D. C.

This report records the full proceedings of the 45th National Conference on Weights and Measures which was held in Washington, D. C., June 6–10, 1960.

PLANE COORDINATE PROJECTION TABLES—PUERTO RICO AND VIRGIN ISLANDS. Coast and Geodetic Survey, Publication 65-2, 8 × 10, paper cover, 12 pages. Available from Superintendent of Documents, Government Printing Office, Washington 25, D. C. $0.15.

The plane coordinate system used in Puerto Rico, the Virgin Islands, and St. Croix Island is based on a Lambert conformal conic projection with two standard parallels. The tables are of use in deriving plane coordinates from geographic positions and geographic positions from plane coordinates. The tables are arranged for machine calculation.

(*Continued on page 115.*)

WANTED

The supply of several back issues of SURVEYING AND MAPPING is very low. For a limited period the American Congress on Surveying and Mapping will pay to members $1.00, plus postage, for each complete copy of the following issues, if sent to American Congress on Surveying and Mapping, Room 430 Woodward Building, 733 15th Street, N.W., Washington 5, D.C.:

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Vol. XIX, No. 1.

PHOTOGRAMMETRY and PHOTO-INTERPRETATION

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STEPHEN H. SPURR, The University of Michigan

This Second Edition of the author's widely used and highly successful "Aerial Photographs in Forestry" discusses and utilizes significant developments in the techniques of aerial photography, photogrammetry, and photo-interpretation. Book brings together specialized material on the use of aerial photographs in vegetation mapping, forest inventory, and forest management. Abundant illustrations. "*Exceptionally interesting and instructive.*"—SOIL SCIENCE. *2nd Ed., 1960. 472 pp.; 170 ills., tables.* $12

ELEMENTS OF PHOTOGRAMMETRY

WILFRED H. BAKER, West Virginia University

New! This compact book presents the fundamentals of photogrammetry in a clear and logical order. It explains the planning of a flight mission, the assembly of the photographs, and the use of stereoscopic instruments. Book discusses both vertical and oblique photographs and combinations of them. *1960. 199 pp., 144 ills.* $5.00

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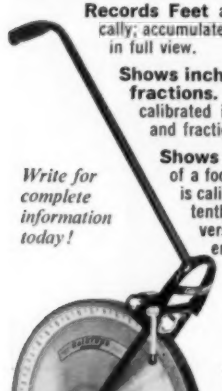

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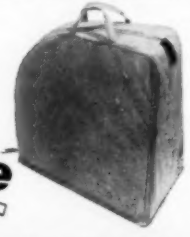

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MEETINGS

PAST, PRESENT, AND FUTURE

The 4th Annual Conference of the Illinois Registered Land Surveyors Association was held at Urbana, Ill., February 13–14, 1961.

The 2nd Land & Construction Surveyors Conference was held at Pennsylvania State University, University Park, Pa., January 16–18, 1961.

The 54th Annual Meeting of the Canadian Institute of Surveying was held at the Chateau Laurier, Ottawa, Canada, February 8–10, 1961.

The Virginia Association of Surveyors held its annual meeting at Motor House, Williamsburg, Va., January 20–21, 1961.

The ASP-ACSM Combined Meetings & Co-Exhibit were held March 19–25, 1961, at the Shoreham Hotel, Washington, D. C.

The 9th Annual Convention of the California Council of Civil Engineers & Land Surveyors was held January 26–28, 1961, at the Miramar Hotel in Santa Barbara, Calif.

The 8th Annual Meeting of the Association of Newfoundland Surveyors was held January 23–24, 1961, at the Newfoundland Hotel, St. John's, Newfoundland.

The 9th Annual Indiana Land Surveyors Conference, sponsored by the Indiana Society of Professional Land Surveyors and the School of Civil Engineering, Purdue University, was held at Purdue University, Lafayette, Ind., January 12–14, 1961.

The 10th Annual Meeting of the Association of Provincial Land Surveyors of Nova Scotia was held at the Lord Nelson Hotel, Halifax, Nova Scotia, November 21–22, 1960.

The 69th Annual Meeting of the Association of Ontario Land Surveyors was held February 13–15, 1961, at the Prince Edward Hotel, Windsor, Ontario, Canada.

The South Carolina Society of Registered Land Surveyors held its annual meeting on January 14, 1961.

The American Society of Civil Engineers will hold its spring convention at the Hotel Westward Ho in Phoenix, Arizona, April 9–14, 1961, and its Surveying and Mapping Division has scheduled two sessions—April 10, at 2:30 p.m., and April 11, at 2:30 p.m.

Abstracts of Articles on Geodesy and Related Fields

The Army Map Service, of the Corps of Engineers, U. S. Army, publishes quarterly a series of processed sheets under the title: "Abstracts of Articles on Geodesy and Related Fields." The following excerpts are from the issue bearing the date of October 1960 and are selected for reprinting in SURVEYING AND MAPPING as being of possible interest to a considerable percentage of our readers. The selection has been somewhat arbitrary, and only those abstracts believed to be of quite general interest have been included. —EDITOR

732 *Principles of University Training in Geodesy and Cartography at the Prague Technical College* (Prinzipien der Hochschulausbildung in der Geodäsie und Kartographie an der Technischen Hochschule Prag). Prof. Dr. Ing. J. Böhm.

After glancing back at the historical development of higher learning in geodesy and cartography at the Prague Technical College, special trends of geodetic university studies and the organization of the faculty at the department of surveying are discussed.

The first two years of study are devoted to general training in basic disciplines.

Geodetic specialization emphasizes geodesy, astronomy, gravimetry, and geodetic applications to engineering construction and mining. The last two semesters also include photogrammetry.

Cartographic specialization emphasizes geography.

The present plan of studies contains ten semesters, of which the last semester is reserved for preparing and writing a thesis in one of the specialized fields of study.

For the purpose of improving the connection between university training and practical requirements, the principles of a planned study reform are presented.

In conclusion, reference is made to the significance of cooperation between the technical institutions of Prague and Dresden.

VERMESSUNGSTECHNIK (German) AMS-GL-B664.7350, Vol. 7, No. 10 (1959)-mc

742 *Tellurometer Measurements in 1958 (by Dept. I of the German Geodetic Research Institute) in the Munich Base Development Net* (Tellurometermessungen 1958 (der I. Abteilung des D.G.F.I.) im Basisvergroesserungsnetz Muenchen). M. Kneissl and R. Sigl.

In 1958, several sides in the Munich base development net were measured with a Tellurometer, acquired for the use of the Greenland expedition in 1959. The accuracy obtained in the side measurements proved to be independent of the side lengths. A comparison of the results for the sides Munich–Schweitenkirchen (41.0 km) and Munich–Hohenpeissenberg (56.3 km) with those obtained from existing trigonometrical measurements showed that the Tellurometer measurements gave slightly too long side lengths as compared to the principal triangulation net (scale factor about $1 + 6 \times 10^{-6}$), but agreed well with the length of the side Munich-Schweitenkirchen derived from the Clauss base.

The adjustment of the trilateration net, repeated several times, resulted in a mean error for the unit of weight averaging ± 0.07 m.; the corrections to the measured sides average ± 3.5 cm. The average accuracy of the position of the new points, determined by trilateration only, was ± 0.1 m.

BAYERISCHE AKADEMIE DER WISSENSCHAFTEN, Mathematisch-Naturwissenschaftliche Klasse, Abhandlungen, Neue Folge (German) AMS-GL-B664.2600, No. 100 (1959)-ms

744 *New Types of Tellurometers* (Neue Tellurometertypen). H. Draheim

In January 1960, the firm of Gebr. Wichmann presented some newly developed instruments of the Tellurometer type.

One was a compact Tellurometer, Type M/RA 2, which can be used as a master as well as a slave station.

The other was the "Hydrodist Measurement Equipment" used mainly to measure distances of moving ships to fixed stations on land. In principle, this equipment consists of two Tellurometers working on different carrier frequencies

eliminating the fine readings so that the constantly changing distances can be read continuously. The manufacturer states a measurement accuracy of ± 1.5 m.

ALLGEMEINE VERMESSUNGSNACHRICHTEN (German) AMS-GL-B664.7002, No. 4(1960)-ms

749 *The Problems of Our New Projection System* (Az új vetületi rendszerünkkel kapcsolatos kérdések). Dr. Lajos Homoródi.

For the past several years the small-scale, topographic maps of Hungary have been based on the Gauss-Krueger projection, while the cadastral maps retained either the stereographic projection dating back to 1864, or the oblique axis cylindrical projection, introduced in 1908. Thus, the problem arose: Which projection should be used for the new triangulation net nearing completion, and whether the cadastral maps should be converted into the Gauss-Krueger system, or remain in their original projection?

The article discloses the viewpoints which governed the discussion of these questions by the Geodetic Committee of the AFTH (State Office of Geodesy and Cartography). The following decision was reached:

The computation of the triangulation and the preparation of the maps should be carried out on the Gauss-Krueger projection, with 3° zones, applying the scale factor of 0.9999.

This solution has several advantages. First, two zones will be sufficient to cover all of Hungary (instead of the previous 4 zones) with 18° and 21° respectively, as central meridians. These will be asymetric zones, elongated east and west towards the boundaries of the country, because otherwise the area west of the Ágfalva-Velem-Rédics line would fall into the 15° CM zone, and the area east of the Tarpa-Fehérgyarmat-Nagyecsed line would fall into the 24° CM zone, respectively. By introducing the scale factor of 0.9999, the linear distortion will not be more than 16 cm. per km., even in these boundary areas.

Other advantages of this solution are: (a) it reduces to a minimum the number of projection zones (coordinate systems); (b) it can be introduced immediately; the necessary tables being available, time and expense can be saved; (c) for about 50 percent of the country's territory, transformation of coordinates will be unnecessary for medium- and small-scale mapping; (d) it is universal and international in character, which is advantageous not only since the necessary tables are available but also because the system is the basis of most international operations.

The author also suggests a detailed program which could be followed to introduce the new projection system with the minimum of interruption of current geodetic activities.

GEODEZIA ES KARTOGRAFIA (Hungarian) AMS-GL-B661.7200, Vol. 11, Nos. 2 & 3 (1959)-af

756 *Comparison Between the 1949 and 1958 Precise Levelings in the Trieste Harbor Area* (Confronto fra la livellazione di precisione 1949 nella zona portuale di Trieste ed una ripetizione effettuata nel 1958).

The 1949 precise leveling in the Trieste harbor area was repeated in 1958, in order to check differences in elevation during that time interval. The earlier leveling had been intended to connect the bench mark of the reconstructed Oceanographic Experimental Institute. (*Istituto Sperimentale Talassografico*) to the zero point of the tide gauge of Molo Sartorio.

It was found that about 23 bench marks had either disappeared or could otherwise not be recovered. Nine bench marks were found to be reliably recoverable, and 22 new bench marks were established.

Instruments used in the earlier leveling were a Zeiss III level and invar tapes; the new leveling was carried out with a Zeiss Ni2 automatic level.

The accuracy of the 1958 leveling is:
$\sigma = 0.24$ mm/km. (systematic probable error)
$\eta = 0.26$ mm/km. (accidental probable error),
which is very close to the established limits for precise leveling of the IGGU.

A comparison of the results of the 1949 and 1958 leveling yields a maximum relative movement of – 2.9 mm. per year.

A sketch of isokinetic lines of vertical displacement (equidistance 0.5 mm/year) from 1949 to 1958 is appended.

Future periodic levelings will have to confirm the significance of the results, i.e. sinking of the docks and some harbor areas.

Molo Sartorio shows a very slight sinking. If confirmed, this will be of particular importance, since the Austrian leveling datum is Molo Sartorio.

BOLLETTINO DI GEOFISICA TEORICA ED APPLICATA (Italian) AMS-GL-B641.5500, Vol. I, No. 4 (1959)-mc

772 *The Adjustment of the USSR Astro-Geodetic Net* (K voprosu ob uravnivanii astronomo-geodezicheskoy seti SSSR) B. N. Rabinovich

The article discusses the problem of the read-

justment of the astro-geodetic net of the USSR which is to be undertaken upon completion of the field work in 7–8 years. The Commission for the Establishment and Adjustment of the National Geodetic Net in the USSR decided in its Resolution No. 2 that Krasovskiy's method of projection should be used, and that Laplace azimuths and bases should be treated as non-adjustable quantities. At present the question is being investigated whether the adjustment should be carried out by angles or by directions.

The author estimates that the completed astro-geodetic network will have an east-west extent of 9,000 kilometers, and a north-south extent of 2,400 kilometers. With each polygon (loop) covering an area of 40,000 square kilometers (in exceptional cases up to 60,000 sq. km.), it is estimated that the network will consist of approximately 440 polygons with 12 east-west arcs and 41 meridional arcs. With an average of 15 simple triangles in each of the 930 sectional arcs, the adjustment will involve a total of between 18,000 and 23,000 condition equations. If the adjustment is carried out by indirect observations the number of normal equations would be about 35,000.

The previous adjustments of the first-order triangulation in the USSR were not entirely rigorous since interdependent functions were treated as observed quantities. It is now proposed to carry out an absolutely rigorous adjustment which, despite the enormous number of equations involved, is feasible for the following reasons:

1. The use of the method of Pranis-Pranevich would break the adjustment computations down in partial systems, and not more than 1/6 to 1/7 of the total number of equations would enter into the connecting system;

2. The dependence between equations formed for partial systems at considerable distance from one another is small;

3. The use of high-speed electronic computing equipment.

Regarding the question whether the adjustment should be made by angles or by directions, the author states that the adjustment by angles will minimize the deformations in the net due to refraction and lessen the systematic swing of the chains. However, if Laplace azimuths and base lengths are held fixed at intervals of 200 kilometers, this precaution would limit the systematic distortions, and the residual distortions will be smaller in the adjustment by directions.

Geodeziya i Kartografiya (Russian) AMS-GL-B675.2214, No. 12 (1959)-ap

773 *Adjustment of Traverse Nets by the Method of Trilateration* (Uravnivaniye poligonometricheskikh setey metodom trilateratsii) F. F. Pavlov.

In a network of traverse lines intersecting at several junction points, the observed traverse lines between junctions may be replaced by straight lines which will then form a trilateration net. The author suggests the adjustment of this trilateration net by the method of indirect observations. The results will be very close to those obtained by the rigorous least-squares adjustment of the traverse.

After developing the formulae for the observation equations, the author gives a numerical example of the adjustment of a traverse net with one junction point. Having obtained the corrections to its preliminary coordinates, the position of the junction point is held fixed and the individual traverses are adjusted by any of the conventional methods.

Geodeziya i Kartografiya (Russian) AMS-GL-B675.2214, No. 12 (1959)-ap

SIAM's Visiting Scientists Lecturship Program

(Read on! This is not what you think it is.)

SIAM (Society for Industrial and Applied Mathematics) is continuing through the 1960–61 academic year its Visiting Scientists Lectureship Program and has published a booklet descriptive of the program, the lecturers, and the topics they undertake to discuss. The program is divided into two parts: A. Visits to Academic Institutions, and B. Visits to Non-Academic Institutions. Part A is supported, at least in part, by the National Science Foundation, while Part B is of a self-supporting nature.

Some of the announced lectures might easily be of interest to surveyor organizations, especially those on computational methods, computer installations, and mathematics related thereto.

Further information may be obtained from Dr. John K. Sterrett, Chairman, SIAM Lectureship Program, 2321 Jameson Street, S.E., Washington 21, D. C.

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Now Hear This

A total of 763 additional timesavers to relieve the tedium of routine drawing for draftsman, artist, or mapmaker are listed in a new 28-page catalogue offered by Chart-Pak, Inc., Leeds, Massachusetts, manufacturer of preprinted pressure-sensitive tapes, symbols, and sheets for use in the preparation of graphic visual aids.

Modern Talking Picture Service, Inc., 3 East 54th Street, New York 22, N. Y., has published a new guide to technical films for use by business, industry, and commercial and engineering colleges. More than 130 films dealing with specific technical subjects are offered on a free loan basis. For your copy of "Modern's Catalog of Free Loan Technical Films," write to the above address. Some of these might be suitable for showing at Section meetings.

Drafting pens tipped with tungsten carbide (Carboloy) are described in a product data sheet now available from Keuffel & Esser Co., Third and Adams Street, Hoboken, N. J.

A six-page folder is now available from Keuffel & Esser Co., to describe its new, economy-priced 8935 "Doric" (R) Lettering Set. Illustrations include samples of the letter faces and sizes that can be drawn with the 8935 Doric. Letters may be formed at any slant up to 22½° from the vertical by adjustment of the scriber arm.

Among several, noncredit, review courses given by the University of Virginia, Division of Extension and General Studies, Northern Virginia Center, 1206 N. Quincy St., Arlington 1, Va., is one, "Land Surveying Review," which should be of interest to our readers in the Washington Metropolitan Area. The course begins April 3, 1961; meets Mondays and Wednesdays from 7:00 to 9:00 p.m., at George Mason College (Bailey's Crossroads); runs for 12 meetings; and the fee is $15.00. Preliminary registrations can be made by mail or telephone JA 7–3125, JA 8–6660, or JA 2–9118.

Applications for admittance to the new civil engineering program at the Kellogg Campus of California State Polytechnic College are being accepted. The State Board of Education has approved the college's application to offer the curiculum. Included among the course offerings will be *elementary surveying*, engineering drafting, descriptive geometry, and numerous other engineering subjects.

Keuffel & Esser's new "Leroy" (R) "020"

(Continued on page 115.)

Map Information

This department was inaugurated for the purpose of bringing to the attention of the members information pertaining to the availability of maps, surveys, etc., with particular emphasis on how such material can be procured. It is believed that through an interchange and dissemination of such information maximum benefits will accrue to the surveying and mapping profession.—EDITOR

Topographic Maps

THE FOLLOWING quadrangle maps were published or became available for distribution by the U. S. Geological Survey between September 1 and November 30, 1960. The list includes newly compiled maps; revised maps on which contours and drainage usually are unchanged, but the works of man are brought up to date; and series-converted maps which are 15-minute maps produced from four 7½-minute maps of the same area. The maps are new unless otherwise desginated by numerical superscript.

The quadrangle name (in capital letters) is followed by the name of the county (in upper- and lower-case letters) that contains the place or feature for which the quadrangle is named.

All maps are available with or without the green overprint that indicates woodland. These maps show the shape and elevation of the land surface (represented by contour lines, printed in brown—except those marked with the letter (P), which are planimetric); water features (in blue); works of man, including cities, towns, and scattered habitations, schools, churches, railroads, roads and boundaries, place and feature names (in black); and woodland areas (in green). Principal roads are shown by a red overprint. In areas that have been covered by Bureau of Land Management surveys, township and section lines are shown. The State rectangular coordinates and the UTM 1,000-meter grid systems are indicated in the margins of the maps. An information folder further describing topographic maps is available on request.

Standard quadrangle maps may be obtained for 30 cents per copy. A discount of 20 percent is allowed on orders amounting to $10 or more at the retail price; a discount of 40 percent is allowed on orders amounting to $60 or more. Orders should be addressed to the U. S. Geological Survey, Washington 25, D. C., (or Denver 15, Colorado, for maps of areas west of the Mississippi River).

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* Indicates 15-minute quadrangles; all others are 7½-minute quadrangles.
[1] Indicates a revised map.
[2] Indicates a series-converted map.
† Indicates availability in either a contour or a shaded-relief edition.
‡ Indicates preliminary black and white edition.

Alabama

ADAMSVILLE—Jefferson
ALTOONA—Etowah
BIRMINGHAM SOUTH—Jefferson
BOAZ—Marshall
BROOKSVILLE—Blount
CAHABA HEIGHTS—Jefferson
CULLMAN—Cullman
DOUGLAS—Marshall
GARDENDALE—Jefferson
HOLLY POND—Cullman
IRONDALE—Jefferson
ODENVILLE—St. Clair
ONEONTA—Blount
PELL CITY—St. Clair
PINSON—Jefferson
SPRINGVILLE—St. Clair
SUSAN MOORE—Blount
VANDIVER—Shelby
WESTOVER—Shelby

Alaska

OPHIR A-6*
OPHIR D-6*
PRINCE RUPERT C-2 & C-3*
SKAGWAY B-4*
SLEETMUTE C-8*
SLEETMUTE D-8*
TALKEETNA C-1*

Arizona-California

CROSS ROADS—San Bernardino
PARKER DAM*—San Fernando
STANDARD WASH—Mohave

Arizona-Nevada

SPIRIT MOUNTAIN SE—Mohave

Arkansas

DANSBY—Lee

California

AGUA CALIENTE SPRINGS—San Diego
BORREGO SINK—San Diego
CAMBRIA—San Luis Obispo

CHILAO FLAT—Los Angeles
CLARK LAKE—San Diego
EARTHQUAKE VALLEY—San Diego
FIGUEROA MTN.—Santa Barbara
HEMET*—Riverside
JACUMBA—San Diego
LAKE CACHUMA—Santa Barbara
LOMPOC—Santa Barbara
LOMPOC HILLS—Santa Barbara
LOS OLIVOS—Santa Barbara
PALM SPRINGS*—Riverside
SAN RAFAEL MTN.—Santa Barbara
SANTA MARIA—Santa Barbara
SANTA YNEZ—Santa Barbara
SHELL REEF—Imperial
SWEENEY PASS—San Diego
TENT HILLS—Kings
TRANQUILLON MTN.—Santa Barbara
TUBB CANYON—San Diego
WATERMAN MTN.—Los Angeles
WHALE PEAK—San Diego
ZACA CREEK—Santa Barbara

California-Nevada

UBEHEBE CRATER*—Inyo

Colorado

COMO*[2]—Park
EVERGREEN[1]—Jefferson
FLYING A RANCH—Pueblo
FRAZER*—Grand

Florida

ESPANOLA—Flagler
FALMOUTH—Suwannee
FAVORETTA—Flagler
FLAGLER BEACH EAST—Flagler
FLAGLER BEACH WEST—Flagler
FRINK—Calhoun
GREEN POINT—Franklin
GRETNA—Gadsden
GUM LAKE—Polk
LAKE LOUISA—Lake
LIVE OAK WEST—Suwannee
MATANZAS INLET—St. Johns
NEW SMYRNA BEACH—Volusia
ORMOND BEACH—Volusia
PORT ORANGE—Volusia
POYNER—Polk
QUINCY—Gadsden
RED HEAD—Washington

Hawaii

ANAEHOOMALU—Hawaii
HONAUNAU—Hawaii
HUALALAI—Hawaii
KOKO HEAD[2]—Honolulu
PUU ANAHULU—Hawaii
PUU LEHUA—Hawaii

Idaho

STREVELL*—Cassia

Illinois

NEW ATHENS*[2]—St. Clair

Illinois-Iowa

EDGINGTON*[2]—Rock Island

Illinois-Wisconsin

SOUTH BELOIT—Winnebago

Indiana

HAYDEN—Jennings
HOLTON—Ripley
LAPAZ—Marshall
MIAMI—Miami
NAPPANEE EAST—Elkhart
REXVILLE[2]—Ripley
SAN JACINTO—Jennings
SHELBY—Lake
SHOALS[1]—Martin
STROH[1]—Lagrange

Kansas

HARRIS DRAW*—Wallace
HORSETHIEF DRAW*—Wallace
WALLACE*—Wallace
WESKAN*—Wallace

Kentucky

AUSTERLITZ[1]—Bourbon
BOWLING GREEN NORTH[1]—Warren
BROOKS[1]—Bullitt
DANVILLE[1]—Boyle
HARRODSBURG[1]—Mercer
LEXINGTON EAST[1]—Fayette
MOUNT WASHINGTON[1]—Bullitt
NICHOLASVILLE[1]—Jessamine
SIMPSONVILLE[1]—Shelby
TAYLORSVILLE[1]—Spencer
WINCHESTER[1]—Clark

Kentucky-Indiana

HENDERSON[1]—Henderson

Kentucky-Ohio

VANCEBURG*[2]—Lewis

Kentucky-Tennessee

MODEL[1]—Stewart
ROARING SPRING[1]—Trigg

Louisiana

EUNICE*—St. Landry
GREENS BAYOU—Cameron
HAMMOND*—Tangipahoa
HARRISONBURG*—Catahoula
KINDER*—Allen

Maine

CASCO BAY*[2]—Cumberland
MOUNT DESERT*[1]—Hancock
PIERCE POND*[2]—Somerset
SPENCER LAKE*[1]—Somerset

Maine-New Hampshire

YORK*[2]—York

Massachusetts

EAST LEE[1]—Berkshire
GREAT BARRINGTON[1]—Berkshire
OTIS[1]—Berkshire

Massachusetts-Connecticut

HAMPDEN[1]—Hampden

Michigan

BALDWIN*—Lake
CLARE*—Clare
EVART*—Osceola
FRONTIER—Hillsdale
HOWARD CITY*—Montcalm
MONTAGUE*—Muskegon
NORTH ADAMS—Hillsdale
READING—Hillsdale
REED CITY*—Osceola

Minnesota

AUDUBON—Becker
CALLAWAY—Becker
JENKINS—Crow Wing
NISSWA—Crow Wing
PINE RIVER—Cass
PINE RIVER SW—Cass
ROSEWOOD—Marshall
VIKING SE—Pennington
VIKING SW—Pennington

Mississippi

PHEBA*—Clay
WEST POINT*—Clay

Mississippi-Louisiana

POPLARVILLE*—Pearl River

Missouri

HIGDON*[2]—Madison

Missouri-Illinois

BRUSSELS*[2]—Calhoun
KIMMSWICK*[2]—Jefferson
SAINT CHARLES*[2]—St. Charles

Montana

MILLER COULEE*—Valley

Montana-Wyoming-Idaho

WEST YELLOWSTONE*—Gallatin

Nevada

AWAKENING PEAK*—Humboldt
BLISS*—Humboldt
JIGGS*—Elko
RAILROAD PASS*—White Pine

Nevada-Arizona

FIRE MOUNTAIN—Mohave
MOUNT DAVIS—Mohave
SPIRIT MOUNTAIN NW—Clark

Nevada-California

SEARCHLIGHT*—Clark

New Hampshire

GILMANTON*[1]—Belknap
MOUNT CHOCORUA*[1]—Carroll
WOLFEBORO*[1]—Carroll

New Hampshire-Maine

DOVER*[2]—Strafford

New Jersey-Pennsylvania

TRENTON EAST[1]—Mercer

New Mexico

ALAMEDA[1]—Bernalillo
ALBUQUERQUE EAST[1]—Bernalillo
ALBUQUERQUE WEST[1]—Bernalillo
CANADOR PEAK*—Hidalgo
CLIFF*—Grant
LOMA DE LAS CAÑAS—Socorro
LOS GRIEGOS[1]—Bernalillo
REDROCK*—Grant

New Mexico-Texas

ALAMO MOUNTAIN*—Otero

New York

ALEXANDRIA BAY—Jefferson
CHARLOTTEVILLE—Schoharie
CHIPPEWA BAY—St. Lawrence
COOPERSTOWN—Otsego
DAVENPORT—Delaware
DUNKIRK*—Chautauqua
EAST SPRINGFIELD—Otsego
EIMESTON—Otsego
FORT PLAIN—Montgomery
HARPERSFIELD—Delaware
HARTWICK—Otsego
MORRIS—Otsego
NORWICH*[2]—Chenango
NUMBER FOUR*—Lewis
ONEONTA—Otsego
OTEGO—Otsego
RICHFIELD SPRINGS—Otsego
RICHMONDVILLE—Schoharie
SANGERFIELD*[2]—Oneida
SCHENEVUS—Otsego
SPROUT BROOK—Montgomery
STAMFORD—Delaware
SUMMIT—Schoharie
THOUSAND ISLAND PARK—Jefferson
UNADILLA FORKS—Otsego
WEST DAVENPORT—Delaware
WESTFORD—Otsego

North Carolina

FAYETTEVILLE[1]—Cumberland
GARLAND*—Sampson
LOBELLA[1]—Moore
MANCHESTER[1]—Cumberland
NIAGARA[1]—Moore
OVERHILLS[1]—Harnett

North Dakota

CROFF—McKenzie
DICKINSON NORTH—Stark
DICKINSON SOUTH—Stark
LEHIGH—Stark
LONE BUTTE NW—McKenzie
WALCOTT—Richland
WEST FARGO—Cass

North Dakota-Minnesota

CHRISTINE—Richland

FARGO NORTH—Cass
FARGO SOUTH—Cass
HICKSON—Cass

Ohio

BELLEVUE—Huron
BRADNER—Wood
CLYDE—Sandusky
GARRETTSVILLE—Portage
HELENA—Sandusky
MANTUA—Portage
PEMBERVILLE—Wood
VERMILION EAST—Erie
VERMILION WEST—Erie
WIGHTMANS GROVE—Sandusky

Oklahoma

PAGE*—Le Flore

Oregon

PRAIRIE CITY*—Grant
SAWTOOTH CREEK*—Harney
WEST MYRTLE BUTTE*—Grant

Pennsylvania

ALLENTOWN*[1]—Lehigh
BIGLERVILLE—Adams
BLACK MOSHANNON—Centre
BUTLER KNOB—Huntingdon
CHAMBERSBURG—Franklin
CONNEAUTVILLE—Crawford
ELLIOTT PARK—Clearfield
HUNTLEY—Clearfield
IRVONA—Clearfield
MAHAFFEY—Clearfield
MAHANOY*[2]—Schuylkill
McCONNELLSBURG—Fulton
McSHERRYSTOWN—Adams
MEXICO—Juniata
PHILIPSBURG—Centre
PORT MATILDA—Centre
SAINT THOMAS—Franklin
SCOTLAND—Franklin
WAYNESBORO—Franklin
WESTOVER—Clearfield
WILLIAMSON—Franklin

Puerto Rico

BARRANQUITAS[1]—Barranquitas
CAMUY[1]—Camuy
COMERIO[1]—Comerio
COROZAL[1]—Corozal
EL YNUQUE[1]—Rio Grande
FAJARDO[1]—Fajardo
JUNCOS[1]—Juncos
NAGUABO[1]—Naguabo
OROCOVIS[1]—Orocovis
SAN SEBASTIAN[1]—San Sebastian

South Carolina

SALEM—Oconee
SEWEE BAY—Charleston
WALHALLA—Oconee

South Carolina-Georgia

TAMASSEE—Oconee

South Dakota

ENNING—Meade
FAIRPOINT NW—Meade
FAIRPOINT SE—Meade
FAIRPOINT SW—Meade
REDOWL—Meade
STONEVILLE—Meade
VOLUNTEER NE—Butte
VOLUNTEER NW—Butte

Tennessee

BOONE DAM[1]—Washington
DENMARK—Madison
JONESBORO[1]—Washington
MEDINA—Gibson
THARPE[1]—Stewart
WESTOVER—Madison
WHITEVILLE—Hardeman

Tennessee-Kentucky

FORK RIDGE[1]—Claiborne

Tennessee-Virginia

CHURCH HILL[1]—Hawkins
KINGSPORT[1]—Sullivan

Texas

ARLINGTON—Tarrant
BEAUMONT EAST—Jefferson
BRITTON—Ellis
BUDA*—Hays
CARROLLTON—Dallas
CARTHAGE*—Panola
CEDAR BAYOU—Harris
COLLEYVILLE—Tarrant
CUT AND SHOOT—Montgomery
FERRIS—Ellis
GARLAND—Dallas
GRAPEVINE—Tarrant
HAMON—Gonzales
INDIA—Ellis
IRVING—Dallas
KENNEDALE—Tarrant
LANCASTER—Dallas
LELIA LAKE CREEK—Donley
LIVINGSTONE*—Polk
MANSFIELD—Tarrant
McKNIGHT—Donley
MESQUITE—Dallas
MONTGOMERY—Montgomery
MOORE GROVE—Walker
OTTINE—Gonzales
OUTLAW POND—Montgomery
ROWLETT—Dallas
SAN JACINTO—Walker
SAN SABA—San Saba
SEAGOVILLE—Dallas
SHINNERY CREEK—Collingsworth
WELLINGTON NW—Collingsworth
WOLF RIDGE—San Saba

Utah

MOAB*—Grand

Utah-Colorado

CAJON MESA*—San Juan

Utah-Idaho

COTTON THOMAS BASIN*—Box Elder
PARK VALLEY*—Box Elder
YOST*—Box Elder

Virginia

BROADFORD—Smyth
CARBO—Russell
CEDAR SPRINGS—Smyth
CHARLES CITY*[2]—Charles City
CHATHAM HILL—Smyth
CHILHOWIE—Smyth
DUTY—Dickenson
ELK GARDEN—Russell
GARDEN MOUNTAIN—Tazewell
HUTCHINSON ROCK—Tazewell
LEBANON—Russell
MARION—Smyth
NEBO—Smyth
NORA—Dickenson
RURAL RETREAT—Wythe
SALTVILLE—Smyth
TIPTOP—Tazewell

Washington

ABERDEEN—Grays Harbor
BOYLSTON*[2]—Kittitas
CLE ELUM*—Kittitas

West Virginia

AURORA—Preston
BANCROFT—Putnam
TERRA ALTA—Preston

West Virginia-Ohio

NEW HAVEN—Mason

West Virginia-Pennsylvania

HUNDRED—Wetzel

West Virginia-Pennsylvania-Ohio

WEIRTON—Hancock

Wisconsin

CEDARBURG—Ozaukee
DE FOREST—Dane
HATFIELD*(P)—Jackson
KENOSHA—Kenosha
MADISON EAST—Dane
MADISON WEST—Dane
NECEDAH*(P)—Juneau
PLEASANT PRAIRIE—Kenosha
PORT WASHINGTON*[2]—Ozaukee
PORT WASHINGTON WEST—Ozaukee
RACINE*[2]—Racine
RACINE SOUTH—Racine
STURTEVANT—Racine
WAUNAKEE—Dane

Wyoming

CANYON VILLAGE*—Yellowstone National Park
TWO OCEAN PASS*—Teton

Wyoming-Montana

TOWER JUNCTION*—Yellowstone National Park

Wyoming-South Dakota

TINTON*—Lawrence

In addition to the standard series of quadrangle maps, small-scale (1:250,000) maps of areas in the United States and Territories are being published and distributed. They may be purchased from the Geological Survey for 50 cents per copy. An index to the series is available on request.

Alabama-Tennessee

GADSDEN

British Columbia-Washington

VICTORIA

Idaho

CHALLIS

Nevada-California

RENO

Oregon

ROSEBURG

Texas

LAREDO

Utah-Arizona

ESCALANTE

Special metropolitan and vicinity maps of major United States cities are being published and distributed by the Geological Survey. These maps are prepared from standard 7½-minute maps at the scale of 1:24,000. Vicinity maps may be purchased from The Geological Survey for the prices indicated below.

MADISON AND VICINITY, WISCONSIN. (38 by 45 inches) $1.50.
SHREVEPORT AND VICINITY, LOUISIANA. (43 by 54 inches) $1.50.

State maps are also being published and distributed. These maps may be purchased from the Geological Survey for the prices indicated below.

CALIFORNIA, SOUTH HALF (topographic). (46 by 64 inches) 1:500,000 scale. $2.00.
MAINE (base). (16 by 22 inches) 1:1,000,000 scale. 20 cents.
NEW MEXICO (base). (52 by 54 inches) 1:500,000 scale. $1.00.
PENNSYLVANIA (topographic). (29 by 44 inches) 1:500,000 scale. $2.00.

Lake Survey Charts

PUBLICATION of new editions of the following Lake Survey Charts has been announced by the United States Lake Survey of the Corps of Engineers, U. S. Army. Copies of these charts may be obtained from the U. S. Lake Survey, 630 Federal Building, Detroit 26, Michigan, at $1.00 per copy. Payment is required in advance by P. O. money order or draft, payable to the Treasurer of the United States. A catalog showing the areas described below is available free upon request.

76.—Lake Michigan. South Haven, Mich., to Benona, Mich., at 1:120,000 scale. Insets: South Haven, Mich., at 1:10,000 scale, and Saugatuk Mich., at 1:15,000.

77.—Lake Michigan. Benona, Mich., to Point Betsie, Mich., at 1:120,000 scale. Insets: Pentwater, Mich., and Frankfort, Mich., at 1:10,000 scale.

703.—Lake Michigan. Green Bay south of Peshtigo Point and Horseshoe Point, Wis., including Sturgeon Bay Canal and coast from Jacksonport, Wis., to Kewaunee, Wis., at 1:80,000 scale. Insets: Oconto, Wis., at 1:20,000 scale, and Algoma Wis., at 1:10,000 scale.

704.—Lake Michigan. Beaver Island Group, Waugoshance Point, Mich., to Boulder Reef and north shore from Brevort, Mich., to Seul Choix Point, Mich., at 1:80,000 scale. Insets: Port Island at 1:10,000 scale, and Beaver Harbor, Beaver Island, at 1:15,000 scale.

705.—Lake Michigan. Platte Bay, Mich., to Lake Leelanau, Mich., including the Manitou and Fox Islands, at 1:80,000 scale. Insets: Leland, Mich., at 1:2,500 scale, and South Manitou Harbor, Mich., at 1:30,000 scale.

706.—Lake Michigan. Grand Traverse Bay and Little Traverse Bay, Mich., at 1:80,000 scale. Insets: Petosky, Mich., and Harbor Springs, Mich., at 1:10,000 scale, and Traverse City, Mich., at 1:15,000 scale.

718.—Lake Michigan. Little Bay de Noc, including Escanaba and Gladstone, Mich., at 1:30,000 scale.

735.—Lake Michigan. Manitowoc Harbor and Sheboygan Harbor, Wis., at 1:10,000 scale.

765.—Lake Michigan. Grand Haven, Mich., including Spring Lake and lower Grand River, at 1:15,000 scale.

768.—Lake Michigan. White Lake, Whitehall, and Montague, Mich., at 1:10,000 scale.

Public Land Survey Plats

THE FOLLOWING plats of public land surveys and resurveys were completed and accepted by the Bureau of Land Management between September 1 and November 30, 1960. The class or purpose of the survey is indicated. Copies of plats may be secured from the Bureau offices in the States or from the Director, Bureau of Land Management, Department of the Interior, Washington 25, D. C.

Alaska

U. S. Survey No. 3696—Survey of islands
U. S. Survey No. 3718—Small tracts, Jamestown Bay

Alaska—Copper River Meridian

T. 28 S., R. 54 E.—Extension survey

Alaska—Seward Meridian

T. 13 N., R. 1 E.—Survey, part of subdivisions
T. 14 N., R. 1 E.—Survey, part of subdivisions
T. 14 N., R. 1 W.—Survey, part of subdivisions
T. 18 N., R. 7 W.—Survey, part of subdivisions
T. 18 S., R. 65 W.—Plat of Round Island

Alaska—Fairbanks Meridian

T. 1 N., R. 3 E.—Survey, part of subdivision

California——Humboldt Meridian

T. 2 N., R. 4 E.—Dependent resurvey, part of subdivisions
T. 2 N., R. 5 E.—Dependent resurvey, part of subdivisions

California—Mount Diablo Meridian

T. 16 N., R. 6 E.—Dependent resurvey, part of subdivisions
T. 18 N., R. 11 W.—Dependent resurvey, part of township
T. 16 N., R. 14 W.—Dependent resurvey, part of subdivisions
T. 24 N., R. 19 W.—Dependent resurvey, part of subdivisions

California—San Bernardino Meridian

T. 3 N., R. 2 E.—Dependent resurvey and extension survey
T. 1 N., R. 26 E.—Dependent resurvey, part of subdivisions

Idaho—Boise Meridian

T. 5 N., R. 3 W.—Supplemental survey

Montana—Principal Meridian

T. 11 N., R. 13 W.—Dependent resurvey, part of subdivisions

Nevada—Mount Diablo Meridian

T. 17 S., R. 63 E.—Independent resurvey

New Mexico—New Mexico Principal Meridian

T. 27 N., R. 5 W.—Dependent resurvey
T. 2 S., R. 1 E.—Dependent resurvey
T. 3 S., R. 1 E.—Dependent resurvey
T. 4 S., R. 1 E.—Dependent resurvey
T. 22 S., R. 2 E.—Subdivision of sections
T. 22 S., R. 36 E.—Dependent resurvey
T. 2 S., R. 15 W.—Subdivision of sections
T. 26 S., R. 10 W.—Dependent resurvey
T. 26 S., R. 11 W.—Dependent resurvey

Oregon—Willamette Meridian

T. 33 S., R. 1 E.—Dependent resurvey, part of subdivision
T. 7 S., R. 2 E.—Dependent resurvey, part of subdivision
T. 5 S., R. 3 E.—Dependent resurvey, part of subdivision
T. 35 S., R. 7 E.—Survey of David Hill Cemetery
T. 36 S., R. 12 E.—Survey of Brown Cemetery
T. 36 S., R. 11 E.—Survey of Schonchin Cemetery
T. 11 S., R. 19 E.—Dependent resurvey, part of subdivisions
T. 21 S., R. 2 W.—Dependent resurvey, part of subdivisions
T. 24 S., R. 3 W.—Dependent resurvey, part of subdivisions
T. 23 S., R. 3 W.—Dependent resurvey, part of subdivisions
T. 35 S., R. 3 W.—Resurvey and subdivisional survey
T. 32 S., R. 4 W.—Resurvey and subdivisional survey
T. 35 S., R. 5 W.—Resurvey and subdivisional survey (2 plats)
T. 33 S., R. 6 W.—Resurvey and subdivisional survey
T. 24 S., R. 8 W.—Dependent resurvey
T. 33 S., R. 10 W.—Resurvey and subdivisional survey

Utah—Salt Lake Meridian

T. 18 S., R. 13 W.—Skeleton survey
T. 19 S., R. 13 W.—Skeleton survey
T. 20 S., R. 13 W.—Skeleton survey
T. 18 S., R. 14 W.—Skeleton survey
T. 19 S., R. 14 W.—Skeleton survey
T. 20 S., R. 14 W.—Skeleton survey
T. 14 S., R. 15 W.—Skeleton survey
T. 15 S., R. 15 W.—Skeleton survey
T. 15½ S., R. 15 W.—Skeleton survey
T. 16 S., R. 15 W.—Skeleton survey
T. 17 S., R. 15 W.—Skeleton survey
T. 18 S., R. 15 W.—Skeleton survey
T. 19 S., R. 15 W.—Skeleton survey
T. 20 S., R. 15 W.—Skeleton survey
T. 14 S., R. 16 W.—Skeleton survey
T. 15 S., R. 16 W.—Skeleton survey
T. 15½ S., R. 16 W.—Skeleton survey
T. 16 S., R. 16 W.—Skeleton survey
T. 17 S., R. 16 W.—Skeleton survey
T. 18 S., R. 16 W.—Skeleton survey
T. 19 S., R. 16 W.—Skeleton survey
T. 20 S., R. 16 W.—Skeleton survey
T. 6 S., R. 17 W.—Skeleton survey
T. 7 S., R. 17 W.—Skeleton survey
T. 8 S., R. 17 W.—Skeleton survey
T. 14 S., R. 17 W.—Skeleton survey
T. 15 S., R. 17 W.—Skeleton survey
T. 15½ S., R. 17 W.—Skeleton survey
T. 16 S., R. 17 W.—Skeleton survey
T. 17 S., R. 17 W.—Skeleton survey
T. 18 S., R. 17 W.—Skeleton survey
T. 19 S., R. 17 W.—Skeleton survey
T. 20 S., R. 17 W.—Skeleton survey
T. 6 S., R. 18 W.—Skeleton survey
T. 7 S., R. 18 W.—Skeleton survey
T. 18 S., R. 18 W.—Skeleton survey
T. 19 S., R. 18 W.—Skeleton survey
T. 20 S., R. 18 W.—Skeleton survey
T. 5 S., R. 19 W.—Skeleton survey
T. 6 S., R. 19 W.—Skeleton survey
T. 7 S., R. 19 W.—Skeleton survey

Wyoming—Sixth Principal Meridian

T. 54 N., R. 92 W.—Dependent resurvey

County General Highway Maps

THE FOLLOWING county general highway maps were received by the U. S. Bureau of Public Roads, Washington, D. C., during the period from September 1 to November 30, 1960. Copies of these maps are sent to the Washington office as part of the continuing cooperative Federal-State highway planning program, as they are compiled or revised by the State highway departments.

Inquiries concerning prices and orders should be sent to the respective State highway departments and *not* to the U. S. Bureau of Public Roads.

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GRUNDY
MACON
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Wyoming
WASHAKIE

Old Instructions Help to Surveyors*

By GORDON WOOD

Taken from a talk to the Surveying Functional Section of the 1960 FES Convention.

Have you ever wondered, when examining Government survey notes and township plats, just why some of the sections were run in a direction contrary to the general instructions and the excess and deficiency place on the south and east instead of the north and west as the general instructions read?

Have you ever wondered why some areas were hastily sectioned or not sectioned until years after the original surveys were completed? Why some of the larger lakes were meandered and others not?

These and hundreds of other questions come to mind. We can all do a better job of retracing the work of these pioneer surveyors when we know the answers.

In June 1959, during the First Land Surveyors' Short Course given at the University of Florida, Mr. Thigpen of Jacksonville pointed out that, although we are not able to avail ourselves of the government manuals of instruction, these publications being issued a good many years after the public land surveys in Florida were begun, and not knowing what instructions were given the surveyors who performed the original surveys, we must rely on our own interpretation of the original field notes and plats.

A part of this is true. We have been relying on our own judgment and interpretation of the original Government notes without sufficient knowledge of what the original surveyor *was* instructed to do.

At a very nominal cost from the National Archives, Washington, D. C., copies of the original contracts, letters of instruction and the special instructions issued to the deputy surveyors making the original surveys in our section of Florida are available. Such contracts and instructions pertinent to each county are replete with information.

* Reprinted with permission from the October 1960 issue of the *Journal, Florida Engineering Society.*

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Comment and Discussion

PROFESSOR DODD'S BOOK STILL IN PRINT

R. H. Dodds *—During a recent visit with my mother at Ames, Iowa, I learned that she has a substantial stock of the book my father published in 1944: "Orginial Instructions Governing Public Land Surveys, 1815–1855." My father was the late John S. Dodds, second president of the ACSM.

Judging from the interest in this book displayed by a few southwestern friends to whom I have given it recently, I believe there would be many of our newer members who would find it useful.

* 72 Davis Road, Port Washington, N. Y.

Editor's Note—Details concerning this book and its availability will be found in the "Book Notes" section of the "Books in Review" department. (*See* page 100)

INTERSECTION PROBLEM

Wm. F. Warfield *—I note with interest Mr. Ernest Chrisbacher's comments and article in the September 1960 issue of Surveying and Mapping on the solution of the age-old intersection problem.

Enclosed is an accurate, fast, and simple shortcut method just as the same appeared in the August 1952 issue of *Civil Engineering*. This purely machine method has definite advantage over simultaneous (or any other that I know of) equations, in that both coordinates can be found directly from the stated data without making any sketches or setting anything down on paper. Step No. 5 in this method at first scares most people and does appear awkward. However, with a little practice it is as simple as the rest. (Set non-shift key during this operation and shift manually.)

* * * *

I am associated with a very large surveying office and organization, and everyone in this office uses this method by their own choice, and that includes graduate mathematicians as well as the draftsman novice.

* 5306 Pagewood, Houston 27, Texas.

Editor's Note—The article referred to in Mr. Warfield's letter, as being published in *Civil Engineering*, August 1952, is reprinted below with the permission of the Editor of that magazine. However, Figure 1 has been redrawn because the available copy would not reproduce with sufficient clarity.

SHORTCUT CALCULATING-MACHINE METHOD COMPUTES P.I. OF TWO LINES

The problem of closing a traverse through two known points and an unknown third point can be solved in various ways. When solving for the point of intersection of two lines, a decided advantage over the conventional sine-law method, as well as the method of two simultaneous equations, can be secured by using a calculating machine. The method here described is a simplified version of that presented by Henry G. Weissenstein in *Civil Engineering* for September 1947 (p. 43). The new method eliminates the use of negative coordinates, thus saving considerable time and reducing chances of error. In addition, the use of all positive coordinates conforms more closely to usual engineering practice, reduces the number of terms involved, and minimizes the use of algebraic signs.

The traverse need not be in a coordinated system nor have coordinates established for all points. In any traverse that is not coordinated, the only positive coordinate values needed are those for the two points that the intersecting lines are to originate from, or be passed through. Convenient positive coordinates for these two points can readily be determined as follows:

1. The sums of the latitudes and the departures in the unclosed traverse are noted.
2. Any convenient constant, preferably some even thousand, that is greater than the absolute value of any of the four sums is selected.
3. With due regard to signs, the difference of the northings and southings is then algebraically added to the selected constant for the North coordinate of the second or end point in the unclosed traverse.
4. Likewise, the difference of the eastings and westings is algebraically added to the constant for the East coordinate of the same point.

5. The constant itself is then equal to both the North and East coordinates of the first or beginning point in the traverse.

The following example is the same as Mr. Weissenstein's except that positive coordinates have been substituted for negative ones. In a coordinated grid system, minus coordinates can be converted to positive values simply by moving the point of origin south and west sufficient distances. On the standard traverse form normally used in calculating land surveys, the given data are conveniently entered, as shown in Figure 1.

Example Worked Out

In the bearing column, enter the given bearings of the two line to be intersected. On the same line on the form, in the coordinate columns, enter the coordinates of the point each respective bearing originates from, or is to be passed through. At any convenient place on the same line, write in the tangent of each bearing, as shown in Figure 1, giving these functions their respective algebraic signs according to the quadrant, that is, northeast plus, southeast minus, southwest plus, and northwest minus. The line with the tangent with the largest absolute value is designated as No. 1, the other as No. 2. On the third line of the form, record the algebraic difference of the two tangents. The position of the counter-reverse lever (the small lever near the upper right-hand corner of any standard calculator keyboard) depends on the sign of the tangent of the largest absolute value (line No. 1). If this sign is plus, the counter-reverse lever must be in the "up" position, which it normally is in for positive calculating operations. If the sign is minus, the counter-reverse lever must be in the opposite position for negative operations.

On any standard calculating machine, the operational steps are as follows:

Step 1. Set the decimal points on the machine. The number of decimal places in the upper dials of the carriage (multiplier dials) should be one or more places greater than the number of decimal places in the desired results. The number of decimals on the keyboard must be equal to or greater than the decimals of the trigonometric functions used (five place functions are accurate enough for all practical purposes). The number of decimals in the lower dials of the carriage (product dials) must be equal to the sum of the two. (On a ten-bank machine, 5 decimals in the upper dials, 5 on the keyboard, and 10 in the lower dials, are very satisfactory.) The counter-reverse lever is set at the position indicated by the sign of the tangent of largest absolute value. Neither the counter-reverse lever nor the decimal points will be changed during the calculations.

Step 2. The figures in the line designated as No. 1 are set on the machine in the following order:

East coordinate on lower dials
North coordinate on upper dials
Tangent of bearing on keyboard

Step 3. Without clearing anything, change the upper dials to the North coordinate in line No. 2.

Step 4. Clear the keyboard and set the difference of the tangents (third line) on the keyboard.

Step 5. By appropriate positive and negative multiplication, change the figures in the lower dials to the East coordinate in line No. 2. From the upper dials, record on the fourth line in the proper coordinate column the North coordinate, with all decimals, of the point of intersection.

Step 6. Without clearing, change the upper dials back to the North coordinate in line No. 2.

Step 7. Clear the keyboard only and set the tangent of the bearing in line No. 1 again on the keyboard.

Step 8. Change the upper dials to the North coordinate, with all decimals, of the point of intersection (fourth line). From the lower dials record the East coordinate of the point of intersection on the fourth line.

This completes the calculations for the coordinates of the point of intersection of two lines. With the latitudes and departures resolved from the coordinate differences, a check of the computations can readily be obtained. The tangents or cotangents are computed and the results

Cosine	Sine	Bearing	Distance	Latitude		Departure		Coordinates	
				North	South	East	West	North	East
		N11°24'36"W		tan =	-0.31357	(2)		12843.77	11674.96
		N80°33'00"E		tan =	+6.01013	(1)		13526.42	8207.77
					6.32370				
			(Pt. of	Intersection)				14040.85 482	11299.59

FIGURE 1.—Example shows data as entered for computing coordinates by calculating-machine method.

compared with the correct trigonometric functions of the given bearings. In this example, the calculated tangent of line No. 2 exactly checks the given bearing. The calculated cotangent of line No. 1 checks the given bearing within 2 seconds.

Method Evaluated

Using the sines and cosines of the given bearings to compute the distances of the two lines, the only discrepancy noted is that the computed length of line No. 1 differs from Mr. Wissenstein's determination by 0.01 ft. In the December 1947 issue (p. 50), R. E. Burnett presented his solution of this same problem using the method of two simultaneous equations. The lengths of the lines as determined by Mr. Burnett are in agreement with the results obtained by the simplified method here presented.

(Continued from page 106.)

pencil holds lead 0.020-inch in diameter, reputed to be the "thinnest lead on the market today." The 0.020-inch leads are so thin that they wear down evenly, assuring crisp lines which never vary in width. This should do away with the trips to the pencil sharpener.

(*Continued from page 101.*)

HYDROGRAPHIC MANUAL, by Captain Karl B. Jeffers. Coast and Geodetic Survey Publication 20-2, 7¾ × 10¼, loose leaf, ix + 283 pp., illus. Available from Superintendent of Documents, Government Printing Office, Washington 25, D. C. $2.00.

This edition of the Hydrographic Manual is issued to serve as a guide in the execution and processing of hydrographic surveys. Since Special Publication 143 was issued in 1942 there has been rapid development in control systems and echo sounders which renders that work obsolete in some respects. Although parts of the present text are carried forward from Special Publication 143, much useful information has not been repeated and copies of the 1942 edition should not be destroyed but should be retained for reference purposes.

NINE GLACIER MAPS—NORTHWESTERN NORTH AMERICA. American Geographical Society Special Publication No. 34. New York, 1960. Paper cover, 7½ × 10, 44 pages, illustrated, in cahier with nine, 1:10,000-scale maps. $3.00.

The booklet describes the project which resulted in the production 1:10,000-scale maps of eight glaciers in Alaska and one in Washington. The sheets in the box with the booklet are as follows:

No. 1 Lemon Creek Glacier, Alaska
No. 2 Blue Glacier, Washington
No. 3 Polychrome Glacier, Alaska
No. 4 West Gulkana Glacier, Alaska
No. 5 Worthington Glacier, Alaska
No. 6 Little Jarvis Glacier, Alaska
No. 7 Bear Lake Glacier, Alaska
No. 8 Chikuminuk Glacier, Alaska
No. 9 McCall Glacier, Alaska

INVESTIGATIONS ON THE GRAVITY FIELD AND SHAPE OF THE EARTH, by Urho A. Votila. Publications of the Institute of Geodesy, Photogrammetry and Cartography of the Ohio State University, No. 10, Columbus, 1960. Paper cover, 7 × 10, 92 pages, illustrated.

This work (in English) has been reprinted from the Annales Academiae Scientiarum Fennicae, Series A, III, Geologica-Geographica, No. 55. A list of references which includes 58 items should be of value to the student or research worker interested in these subjects. An important feature is the material on computational methods, including high-speed computers, for the determination of undulations of the geoid and deflections of the vertical.

PLANE COORDINATE INTERSECTION TABLES (2½-MINUTE)—ALASKA. Coast and Geodetic Survey Publication 65-1, Part 50, 8 × 10, paper cover, xi + 211 pages. Available from Superintendent of Documents, Government Printing Office, Washington 25, D. C., at $1.50 per copy.

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DIVISION OF HIGHWAYS CIRCULAR LETTER NO.	File Classification: Planning Design No. 39
TO: All District Engineers and Headquarters Office Department Heads	Date Issued: February 8, 1961 Expires: February 8, 1966
SUBJECT: Monumentation and Recording Cadastral Surveys	

Reference: Land Surveyors' Act, Business and Professions Code (Sections 8768 through 8771). Supersedes Circular Letter dated May 7, 1958, Re: Warning Notice "A", of the Land Surveyors' Act, File reference 640.1-1 and Circular Letter No. 60-259 dated October 5, 1960.

Attached to this circular letter are instructions concerning the [illegible]

to be adequately recorded from a legal viewpoint. However, all subdivision and tract monuments; monuments of streets and highways of other agencies; and section, township, etc. corners, if adequately recorded, shall be replaced, reset or referenced if disturbed. When property corners within a subdivision are the only remaining evidence of the original location of a survey, they shall be preserved also.

Where practical, monuments should be replaced in the same horizontal location.

WILLIAM A. WHITE
EXECUTIVE DIRECTOR
FORUM BUILDING
SACRAMENTO 14, CAL.

CALIFORNIA COUNCIL CIVIL ENGINEERS & LAND SURVEYORS

News of Related Organizations

Massachusetts Association of L. S. & C. E.

The Massachusetts Association of Land Surveyors and Civil Engineers, Inc., an affiliate of the ACSM, held its Sixth Annual Meeting at the Hotel Northampton, Northampton, Mass., on December 2 and 3, 1960.

Judging from the increased registration and the general enthusiasm for the program, the meeting was the most successful yet.

The theme of the program was "Education for the Land Surveying Profession." The keynote speech was a forceful and challenging address delivered by Victor H. Ghent, Past President, Virginia Association of Surveyors, and Secretary, Property Surveys Division, ACSM. Mr. Ghent described very graphically the many fields in which the PSD has been and will be of service to our profession, and then closed his remarks with a challenging "Are you ready?" series of questions, by which he highlighted the ever increasing complexity of our field and the need for increased education both for surveyors-in-training and those already in practice.

Among many outstanding papers, the one receiving widest acclaim was delivered by John G. Pierce, Chairman, Education Committee, Association of Ontario Land Surveyors, on the subject: "The Education of the Ontario Land Surveyor, Past, Present, and Future." This paper, as well as several others, will be published in the Journal of the Massachusetts Association in the near future.

An innovation on the program this year, consisting of six 15-minute papers on the general theme "How We Do It In Our Office," presented by junior members from various surveying offices, was very well received.

Among many interesting exhibits was one sponsored by the ACSM through the "Education for the Land Surveying Profession" Committee of the PSD. This featured a peg-board displaying publications, both educational and otherwise, by many surveyor organizations both on this continent and abroad.

The Association was honored by the attendance of many delegates from other surveyor organizations. Among them were: S. G. Gamble, representing the Canadian Government; H. D. G. Currie, President, Association of Ontario Land Surveyors; M. Ste-Marie, President, La Corporation des Arpenteurs Geometres de la Province de Quebec; Marc Dancose and Charles C. Lindsay from the same organization; H. B. Robertson, Secretary-Treasurer, Association of Provincial Land Surveyors of Nova Scotia; Lester Higbee, representing the ACSM; J. Fred Trowbridge, representing the Connecticut Society of Professional Engineers.

The program listed Gordon E. Ainsworth as general chairman; A. Phillips Bill as assistant general chairman and program chairman; C. Edwin Anderson, arrangements; Edward N. Chapdelaine and Richard D. Thompson, exhibits; Brenton V. Schofield, registration; E. Joslin Whitney, publicity and mailing; Mrs. A. Phillips Bill, ladies program; W. L. Schofield and Mrs. A. Phillips Bill, entertainment of guests.

—A. Phillips Bill
Director, MALSCE

Georgia Association of Registered Land Surveyors

The Georgia Association of Registered Land Surveyors and the School of Civil Engineering of the Georgia Institute of Technology sponsored the 20th Bi-annual Surveying and Mapping Short Course, conducted by the Department of Short Courses and Conferences of the Georgia Institute of Technology, at Atlanta, Georgia, January 26–28, 1961.

Subjects covered during the three-day course included: Ethics and Practices—Your Responsibility; Geodimeter; Calculation of Closed Traverses With Stress on Errors, Significant Figures, and Assumptions; Polaris Observations —Field Procedure and Calculation; Photogrammetry as an Aid to the Surveyor and Engineer; Laws Pertaining to Surveys and Surveyors; Plat and Map Reproductions; F.H.A. Requirements for Surveyors; Client Relationship; Calculation of State Plane Coordinates; Surveying Techniques and Short Cuts; Circular Curves—Arc Definition and Subdivision Applications; Photographic Interpretation of Soils as an Aid to

the Surveyor and Engineer; and New Advances in Surveying Equipment.

Other features of the program included a visit to the Photogrammetry Laboratory of Thomas M. Lowe, Jr., and Associates; the State meeting of the GARLS; Demonstrations of both Polaris observations and the Geodimeter; a banquet and dance.

Various manufacturers displayed their newest equipment in a special display area set apart for their use as exhibitors.

Wisconsin Society of Land Surveyors

EDITOR'S NOTE.—The following report was prepared from *Newsletter* 35, of the Wisconsin Society of Land Surveyors, October 31, 1960, edited by Robert L. Smith, longtime Secretary-Treasurer of the Society.

The annual summer meeting and picnic of the Wisconsin Society of Land Surveyors was held at Regner City Park in West Bend on August 21, 1960. President Roger Mueller officiated at the business meeting which preceded the picnic.

Vern Steinbrecker, Chairman, Membership Committee, distributed and discussed a prepared report listing all land surveyors registered in the State. The report showed that only 132 of the 648 registered surveyors are members of the Society, the remainder representing a large and fertile field for recruitment of new Society members.

Bob Poss, Chairman, Legislative Committee, presented a redraft of proposed bills relating to the revision of statutes governing the county surveyor offices. The redraft, which consolidates two previously proposed bills, was given a general vote of approval prior to a final vote at the annual meeting of the Society in December.

As the result of discussion of methods of simplification of platting procedures, the president agreed to appoint a committee to study the matter, with particular reference to the platting laws of Michigan and Illinois, which appear to be more lenient with respect to platting requirements.

The 1961 officers of the Wisconsin Society of Land Surveyors are as follows:

President—Foster S. Curtiss, Plymouth,

Vice President—Clarence Zellner, Milwaukee, and

Secretary-Treasurer—Robert L. Smith, 839 63rd Street, Kenosha, Wisconsin.

Philippine Society of Geodetic Engineers

At the annual meeting of the Philippine Society of Geodetic Engineers, the following officers were elected for the year 1960–1961:

President—Felipe F. Cruz

Vice President—Bernardino G. Bantegui

Secretary—Norberto S. Vila

Treasurer—Florentino C. Reyes, Jr.

Auditor—Ricardo C. Cruz

PRO—Dominador I. Ilio

Directors—Francisco Banzon, Cristy R. Hernandez, Nicanor G. Jorge, Alfonso R. Sebastian, and Manuel Vergel.

The Society is composed of graduates of the University of the Philippines holding the degree of Bachelor of Science in Geodetic Engineering. Ninety-five percent of the members are actually engaged in surveying practice.

It may be mentioned here that the B. S. in Geodetic Engineering is now a five-year course covering roughly the following areas:

	Units
General Education Courses, including Physics and Mathematics	74
Mechanics	12
Drawing	6
Geodetic Engineering	53
Spanish and other Electives	34
Total	179

The geodetic engineering course consists of the following:

	Units
Plane surveys	4
Topography	3
Railroad curves and earthwork	4
Hydrography	2
Mine surveys	2
Isolated land surveys	4
Cadastral	3
Land mapping	1
Map projections	2
Geodesy	3
Astronomy	3
Geodetic levels	2
Least squares	2
Geodetic surveys	3
Geodetic computations and adjustments	3
Survey management	1
Geodetic engineering laws	6
Photogrammetry	5
Total	53

—NORBERTO S. VILA
Secretary

Illinois Registered Land Surveyors Association

About 40 surveyors from all three local chapters of the Illinois Registered Land Surveyors Association attended a dinner meeting held in the Bismarck Hotel, Chicago, November 18, 1960. Among the many items of business handled at this meeting were: the adoption of the newly formed East Central Chapter, the discussion of the Fourth Annual Conference, the Cook County Planning Ordinance, educational courses, and many others of interest.

Robert Silander was appointed as chairman of the nominating committee, and John Goodell was appointed to head a committee to study the availability of records and plats in the State archives.

This was a high-spirited meeting and provided inspiration for those in attendance.

California Council of Civil Engineers & Land Surveyors

EDITOR'S NOTE.—The following items were gleaned from the *News Letter* of the California Council of Civil Engineers and Land Surveyors, Vol. 1, No. 2, November 1960.

The CCCE&LS opposes a movement by the State Department of Professional and Vocational Standards to take over the enforcement functions of the State boards of registration.

William A. White, Executive Director of the CCCE&LS has been appointed to the national committee of the American Society of Civil Engineers on the Registration of Engineers.

The California Council, American Institute of Architects; and the California Council of Civil Engineers & Land Surveyors have ratified a joint statement condemning competitive bidding.

The Directors of the CCCE&LS have endorsed the idea of an "Academy of Surveyors" which would be a group of recognized experts banded together to set the tone of surveying practice in California. A special committee will develop a proposal for the 1961 State Legislature.

Willard Walker, who represented the ACSM at the FIG committee meeting in June at Brussels, Belgium, has recently been successful in a matter of properly filing for record his original map in place of one that had been annotated without authorization.

Bay Counties Civil Engineers & Land Surveyors Association has merged and consolidated with Associated Civil Engineers and Land Surveyors of Santa Clara County and the Alameda-Contra Costa County Association. This grouping of some eighty member firms is reaffirmation of the profession's loyalty and strength through close working relationship.

The CCCE&LS has revised its code of ethics to reflect the Council's condemnation of competitive bidding and unethical fee arrangement on contingency basis.

The Board of the CCCE&LS adopted a policy on advertising at its meeting of October 1, 1960.

The CCCE&LS *News Letter* (Vol. 1, No. 2, November 1960) presents both pro and con viewpoints on provisions in both the engineer and surveyor sections of the Model Law recently adopted by the National Council of State Boards of Engineering Examiners.

Land Surveyors' Functional Section, N. J. S. P. E.

The Land Surveyors' Functional Section of the New Jersey Society of Professional Engineers held a very successful conference and exhibit at Rutgers University on December 3, 1960, with approximately 250 in attendance. William L. Wissing, PE&LS, served as the chairman of the conference.

Dr. Marvin L. Granstrom, Chairman, Department of Civil Engineering, spoke on behalf of Dean Easton, welcomed those attending the conference, and then discussed several phases of the activities at Rutgers during the year, touching upon the subjects of new buildings, increased enrollment, the graduate program, enlarged faculty, new equipment, research projects, etc.

President Frank C. Manning of the NJSPE spoke concerning the reorganization of the Land Surveyor's Division and the emergence of the present Land Surveyors' Functional Section which now takes its place among several other Functional Sections of the NJSPE.

Chester Mueller, PE&LS, (also a lawyer) spoke on the subject "What the Land Surveyor Should Know About the Law."

Professor Paul P. Rice, Executive Secretary of the Functional Section, discussed the present status of the courses now being offered to surveyors in practice by the extension program.

Kenneth MacFadyen, PE&LS, spoke on the topic "Deed Descriptions vs. Location on the Ground."

After a question-and-answer period, lunch, and a visit to the exhibits, the program was re-

sumed at 2:30 p.m., and Executive Director Charles Dodge discussed the present status of legislative matters affecting engineers and surveyors, particularly surveyors, in New Jersey.

Samuel Sailor, Assistant Professor in Civil Engineering, discussed "Education and the Surveyor," covering the various interim reports and the final report of the A.S.C.E. Task Committee on the Status of Surveying and Mapping, the paucity of instruction in surveying in most engineering curricula, and the efforts being made at Rutgers to increase the amount of available instruction in the various branches of the surveying field.

The success of the conference was due to a large extent to the work of the following committee members: Paul P. Rice, arrangements; E. P. Wyszkowski, registration; Leo Nardini, prizes; D. A. Miniaci, exhibits; Thornton Garlick, publicity; and William L. Wissing, program.

Illinois Registered Land Surveyors Association

The Fourth Annual Illinois Land Surveyors Conference, conducted by the Illinois Registered Land Surveyors Association and the Department of Civil Engineering in cooperation with the Division of University Extension, University of Illinois, held at Urbana, Illinois, February 13–14, 1961, was combined with a Photogrammetry-Surveying Short Course held February 14–16, 1961.

These combined meetings included formal papers, panel discussions, and workshop sessions on a wide variety of subjects of interest to surveyors.

A program of events for the ladies was also provided. Exhibits, both commercial and noncommercial, were on display during the day on both the 13th and 14th, and the evening of the 14th was devoted to the Annual Banquet.

Indiana Society of Professional Land Surveyors

Seventeen members of the Indiana Society of Professional Land Surveyors, many with their wives, met at Turkey Run State Park on October 28, 1960, to review the activities of several committees and to direct the business of the Society. Decisions made at that meeting include: (a) a 1960 yearbook-directory would be printed in December; (b) the historical preservation committee would continue its efforts to obtain more State appropriations to erect a suitable monument at the Initial Point; (c) the legislative committee would propose and sponsor a bill to improve the Registration Act as related to land surveying; and (d) more committee participation was necessary in order to have an effective and useful society.

A bill will be introduced into the 1961 Indiana General Assembly as a result of action of the Indiana Society of Professional Land Surveyors and its legislative committee. Much thought and work has gone into these proposed changes and support of them has been approved by the Indiana Society of Professional Engineers, Indiana Association of Private Practicing Land Surveyors, and the County Surveyors Association.

Kansas Society of Land Surveyors

The following will serve the Kansas Society of Land Surveyors during the year 1961:

President—John P. Kramer
Vice President—Grant A. Brezina
Secretary-Treasurer—Larry E. Wadley
Board Members—
Paul H. Sweeney
Eugene E. McCracken
James L. Bell
Charles N. Pfarr

—Larry E. Wadley
Secretary-Treasurer

East Bay Council Host to Northern California Section

On Friday, November 18, 1960, the East Bay Council on Surveying and Mapping was host to the Northern California Section, ACSM, at the Alameda County Office Building, Hayward, California. The meeting was called to order at 8:00 p.m., with EBCSM General Chairman James R. Godman presiding. Approximately fifty persons were in attendance.

After a short business meeting for the EBCSM, Chairman Godman turned the meeting over to Chairman Paul J. Dowling of the Northern California Section, ACSM, who, in turn, called on C. J. Aggler, who reported the election of the following officers and director to serve the NCS for 1961:

Chairman—James Brennan, San Francisco
Vice Chairman—Charles E. Randlett, Redwood City

(*Continued on page 126.*)

Congress News

ACSM Election Results

The Committee of Tellers—A. F. Striker, F. S. Elkins, and L. A. Svarez, *Chairman*—reports that the balloting for officers and directors of the American Congress on Surveying and Mapping has resulted in the election of the following members, to take office at the 1961 March Convention and to serve during the period from March 1961 to March 1962:

President—Brother B. Austin Barry
Vice President—Walter S. Dix
Directors (March 1961 to March 1963)—
James L. Bell
A. Phillips Bill
Frank A. Clemens
Granville K. Emminizer
Clifford A. Thorpe, Jr.

Oregon Section

The Third Annual Meeting of the Oregon Section ACSM, was called to order by Chairman Francis E. Waggoner at 1:00 p.m., September 24, 1960, in Eugene, Oregon. All present stood and introduced themselves. A good number of all the branches covered by the Congress was represented.

H. B. Chickering, Eugene Photogrammetrist, spoke of the very excellent results in finding section corners by reverse plotting from aerial photographs and of the use of these photographs in right-of-way acquisition.

John B. Gearheart, of Coquille, Registered PE&LS, Chairman of the Land Survey Committee of the Professional Engineers of Oregon, spoke of the Model Law. This is the form drawn up by the National Council of State Boards of Engineering Examiners at their recent conference in Portland, Oregon. In his words, the State Boards had adopted the recommendation of the A.S.C.E. report, that land surveying is a branch of civil engineering, and it was his opinion that the trend to separate the two should be reversed, also that the registration examination should be increased to 16 hours.

A. D. Graham of Salem, Marion County Surveyor, spoke on the subject "Survey Monuments" and ended his talk with the age-old Biblical admonition, "Cursed be he who removeth his neighbor's landmarks, and all shall say Amen."

Mr. Robinson of the Lane County Title Company of Eugene, spoke on "The Relationship of the Surveyor and the Title Company." He asked, "Can someone retrace your work from your description? That is the test of a description." He cautioned about putting things, not done by the surveyor, on maps, and expressed concern about the State Highway Department's failure to tie in section corners to their system of surveys. Mr. Robinson also stated that it was the policy of the Lane County Title Company to give surveyors a key to his office, that their files might be made readily available.

Howard Buford, Lane County Planning Consultant, expressed his opinion that "We all should present new ideas to government leaders if we are to progress." Also, "That expressways decrease accidents by 84 percent, which fact alone, by comparison, justifies the cost in the long run."

The meeting adjourned at 5:00 p.m., to reconvene at 8:00 p.m., at the Eugene Hotel.

The evening meeting was called to order by Chairman Waggoner, who introduced Jim Coombs and C. Oliszewski of the engineering section of the Portland State College. Mr. Coombs remarked that the school would offer some advanced courses in surveying if the interest merited such action.

Past Chairman Fred Darby of Roseburg, Douglas County Surveyor, gave a brief history of the Oregon Section, ACSM, and asked that we consider acting as host to the Western Regional Conference in the near future.

Chairman Waggoner then asked that a vote of thanks be given to Allen Givens, Vice Chairman, who, because of illness, was unable to attend.

Kermit Epps of Portland announced the results of the election of officers for the Section for 1961. The following were elected:

Chairman—H. B. Schminkey, Room 401, City Hall, Portland 4, Oregon.

Vice Chairman—Clair E. Pense, 17021 S. E. Division St., Portland 16, Oregon.

Secretary-Treasurer—Francis E. Waggoner, Courthouse, Eugene, Oregon.

Editor—Harlan G. Scott, 6319 N. E. Going St., Portland 18, Oregon.

Directors—Roy L. Bennett, 1724 S. E. 33rd Avenue, Portland, Oregon, and John B. Gearheart, 1203 N. Folsom Court,, Coquille, Oregon.

The remainder of the evening session was taken up with routine business. Among the actions taken were the following: Dues notices for the Oregon Section to be sent out by December 1st.; all members to be encouraged to bring their wives to dinner meetings; the Chairman to represent the Oregon Section, ACSM, at the forthcoming meeting of the Oregon Association of County Engineers and Surveyors; the Legislative Committee was instructed to work with the Professional Engineers of Oregon, the Professional Land Surveyors of Oregon, and the Oregon Association of County Engineers and Surveyors.

Utah Section

The first regular meeting of the new Utah Section was held at the Union Building of the University of Utah in Salt Lake City on March 8, 1960, with Chairman Herbert Lee presiding. Two of the members—Dean Hill of Nielsen, Reeve, & Maxwell Consulting Engineers, and Jay Sweet of Geotech Land Surveyors—were the speakers for the evening meeting. Their subject was centered on the question, "Should we Continue to Do Things the Hard Way?" with reference to present land surveying methods.

The second regular meeting of the Section was held on May 26 at the Canton Cafe in Ogden. Cliff Bryner, Secretary of the Section, presided over the very well attended dinner meeting. The program, furnished by the Intermountain Region Office of the Forest Service under the direction of Edward Carnahan, Regional Forester, concerned the role of photogrammetry in the management of our national resources. An organized tour of the photogrammetric facilities of the Forest Service in Ogden was provided, with detailed explanation of each step in the reconnaissance and design of access roads to timber sale areas and in the appraisal of timber areas.

The third regular meeting of the Section, held on September 29 at the business office of Knight-Condley Reproduction Specialists in Salt Lake City, was a very informative session devoted to new ideas and procedures in reproduction work. Stephen Magill, technical representative for the Dupont Company, was the speaker for the evening. He discussed the merits and uses of the new polyester films for drafting and reproduction. After the formal meeting, hosts Ed Knight and Clyde Condley provided a tour of their reproduction laboratory.

The activities of the Section for the year have been concerned with the upgrading of land surveying methods. To this end, the Section has resolved to work closely with the Utah Council of Land Surveyors to help promote uniform and good land surveying practices and enabling legislation.

The fourth regular meeting of the Utah Section for 1960 was held at the University of Utah on November 28. There were 35 present. This meeting was the annual election and dinner meeting.

The outstanding feature of this meeting was an address given by Rear Admiral Karo, President of the ACSM. In his presentation, Admiral Karo emphasized the professional and

UTAH SECTION OFFICERS FOR 1961

Left to right: Capt. I. E. Rittenburg, *Secretary-Treasurer;* Prof. Clifford Bryner, *Chairman;* Rear Admiral H. Arnold Karo, *1960 President of ACSM;* Clyde Condley, *Editor;* and Douglas Brammer, *Vice Chairman.*

educational aspects of mapping and surveying using the Australian situation as his example. Admiral Karo was in Utah to address the Fifth Annual Conference on Surveying and Mapping held at the University of Utah. The Utah Section of ACSM is a cosponsor of this annual event.

Two new standing committees were set up: one, a committee to work on the annual Surveying and Mapping Conference mentioned above, and the second, a committee to work with several other organizational committees as an advisory group of the Utah Registration Board for Land Surveyors. It is hoped that this second committee will help to see that a State manual and instruction book will be written for land surveyors and that the examination for land surveyors will be reevaluated and brought up to

date to include the modern aspects of land surveying techniques.

The following were elected as officers for 1961:

Chairman—Prof. Clifford G. Bryner
Vice Chairman—Douglas Brammer
Secretary-Treasurer—Capt. I. E. Rittenburg
Editor—Clyde Condley

—LaMar P. Smith
Section Editor

Southern California Section

The Southern California Section, ACSM, points to a successful year in 1960, and bases its claim on the following accomplishments.

Numerous talks have been given for Los Angeles and outlying areas. and monthly talks on surveying and mapping are planned for the future in various areas of Southern California.

The second edition of the Research Manual of Surveying and Mapping, information for nine counties in the southern part of the State, has been completed for distribution to all members.

An accurate and up-to-date roster of the membership of the Southern California Section has been prepared and was scheduled for distribution in February 1961.

Because of these accomplishments, which have increased the interest of the surveyors and mappers in the Southern California area, a very determined membership drive was staged, and it is believed that the Southern California Section has added more new members and brought more old members back into the ACSM, during 1960, than any other Section in the United States.*

—Editor

At the Annual Dinner, a one-year membership in the ACSM was awarded to each of four leading students in the field of surveying, and each student was accompanied by his professor at the dinner meeting.

Norman Woest, Director of Customer Relations, Title Insurance and Trust Company, under the programmed title "Yesterday," gave a very excellent historical story of Southern California, illustrated with rare slides. This conclusion of the Annual Banquet and Ladies Night sent all home happier and wiser.

—Robert B. Irwin
1960 Editor, SCS

* How about it? Any argument from other Sections?

James W. Robinson, *right*, 1961 Chairman, Southern California Section, ACSM, presents a plaque to James R. Finley, 1960 Chairman, SCS, ACSM.

Colorado Section

The Colorado Section, ACSM, met in the U. S. Geological Survey Auditorium, Building 25, Denver Federal Center, at 8:00 p.m., November 17, 1960, with Chairman J. Loren Adams presiding.

After a few brief items of business had been disposed of, Chairman Adams turned to the program, a panel discussion of "Problems Encountered in the Subdivision of Lands." To set the stage, a couple of cartoons, depicting some of the problems experienced by land surveyors, were flashed on the screen. A somewhat sympathetic chuckle arose from the audience.

Messrs. Robert F. Harrison, PE&LS, Salida, Colorado; Harvey C. Fensten, LS, Denver, Colorado; Howard A. Lane, PE&LS, Denver, Colorado; and John S. Knowles, Area Cadastral Engineer, Bureau of Land Management, Denver, Colorado, were introduced by Chairman Adams who acted as moderator.

Mr. Harrison started the discussion with an illustrated problem he had encountered in the location of a quarter section corner along a section line, the corners of which, when found, were in error by ±102 feet. Certain topographic features and a supposed quarter fence line were also in disagreement with the plat.

Messrs. Fensten and Lane followed, discussing some of their experiences in surveying urban property and how the problems were solved.

Mr. Lane projected an illustration of his problem on the screen. Mr. Fensten stated that many of the land surveyors' problems were the direct result of poorly written legal descriptions of property lines, and other members of the panel concurred.

Mr. Knowles then gave an informative talk, retracing much of the history of government land surveying from early Colonial times to the present. Some points of particular interest were the characteristics of some of the early surveyors, their responsibilities, and decisions that have made our land-office system as it is known today. He had several old maps and plats for examination by the audience.

Mr. Knowles expressed sympathy for the land surveyor and his problems. However, he could not offer much help in relocating corners, once the government had disposed of the property. *It then becomes the duty of the States, counties, and land owners to preserve the land corners.*

A short question-and-answer period followed. The general concensus of opinion was that land surveying would continue to hold out many challenging problems for the surveyor.

W. L. Prouty, PE&LS, then gave an interesting talk on the use of aerial photography in aiding the location of old property lines. He urged land surveyors to use such photographs in their work.

The meeting of the Colorado Section, ACSM, held on December 14, 1960, at the Wyre Auditorium, Denver Public Library, was called to order at 7:30 p.m., with Chairman J. Loren Adams presiding. Twenty-two members and guests attended.

The following officers were elected to serve the Section for 1961:

Chairman—Louis S. Soreide
Vice Chairman—Edwin O. Windham
Secretary-Treasurer—Waldo G. Smith
Editor—William L. Sebachterle

The program for the evening was a panel discussion—"The Colorado Land Surveyors Registration Law." The panel included Samuel Hawkins, PE; George Morris, PE&LS; and Howard Lane, PE&LS. These three panel members were on the committee that prepared the proposed amendment to the existing registration law for surveyors.

Mr. Hawkins opened the discussion with an explanation of the existing law, enacted in 1951, and why a change is necessary. He stated that the number of licensed land surveyors is increasing considerably each year. Fees from licenses were expected to be between $25,000 and $28,000 this year.

Mr. Lane explained several features of the proposed amendment, one of which was to set up a board to prepare and administer examinations for land surveyors. Mr. Morris discussed another feature of the amendment which proposed examination and licensing of Land Surveyor Trainees.

Because this proposed amendment failed to reach the floor for debate in the State Legislature, the panel agreed that the land surveyors must organize and work together if improvement is to be realized.

—E. O. Windham
Secretary-Treasurer

The meeting of the Colorado Section, ACSM, held January 31, 1961, in the Auditorium of Building 25, Denver Federal Center, was called to order at 7:30 p.m., by Chairman Louis Soreide. Sixty-two persons were in attendance. Twenty-six Section members were present; the remaining thirty-six were guests, of whom eighteen indicated a desire to join the ACSM. To the date of this meeting the Section had 51 paid-up members.

Following reports by the Secretary-Treasurer, Chairman Soreide introduced the new Section officers and the chairmen of the standing committees.

Edwin O. Windham, Chairman, Program Committee, outlined the program for the year.

George Perham, Chairman, Education Committee, outlined the training program, which will be in two sections of ten weeks each, open only to members of the Colorado Section.

Mr. Windham introduced the speaker for the evening, Luciano Sanchez of the Cartographic Section, U. S. Geological Survey, Rocky Mountain Area. Mr. Sanchez gave a comprehensive and well-organized talk on the history of mapping and map use from antiquity to the present time.

—Waldo G. Smith
Secretary-Treasurer

North Carolina Section

The North Carolina Section, ACSM, met jointly with the Property Surveys & Mapping Functional Section of the Professional Engineers of North Carolina on November 22, 1960, at the Howard Johnson Restaurant, Greensboro, N. C. Jerry R. Mitchel, Chairman, N. C. Section, ACSM, presided and called the meeting to

order at 8:00 p.m. Twelve N. C. Section members were present.

Ronald Scott spoke on the subject "Subdivision Design" and emphasized the pitfalls to be avoided in layout or design, both in urban and suburban areas.

R. D. Stout moved that the Chairman appoint a committee to meet with State highway officials in an effort to control minimum standards for rural streets. The motion was carried and the following were appointed to the committee: Henry M. Von Oesen, Ronald Scott, Ralph Stout, Jr., and Mack Lewis.

Glenn Walker distributed to all members present a report of the National ACSM Convention entitled "Role of Land Surveyor."

—DALE J. MILLS
Secretary

The following officers were elected to serve the North Carolina Section, ACSM, for the year 1961:

Chairman—Benjamin L. Smith, Jr., Greensboro,
First Vice Chairman—Lee M. Hinshaw, Winston-Salem
Second Vice Chairman— N. Glenn Walker, Greensboro
Secretary–Editor—Dale J. Mills, Gastonia
Treasurer—Robert E. Wilson, Greensboro

Texas Section

For the first time, the Annual Meeting of the Texas Section, ACSM, was held jointly with the newly-organized Gulf Coast Chapter of the Texas Surveyors Association on Friday evening, December 9, 1960, at Del Webb's Highway House, Houston, Texas. A social hour and dinner were enjoyed before the meeting by the wives and friends of the members of both groups.

Mr. and Mrs. Bennett G. Jones, U. S. Coast and Geodetic Survey, Washington, D. C., were introduced as special guests. Mr. Jones is supervising the mapping of the mean low water line along a portion of the Louisiana coast.

Presiding Chairman, Joe A. Hicks, called for reports of the various committees. He also presented his report on the 1960 activities of the Section. The highlight of the year was the successful Southwest Regional Conference of the A.C.S.M., which was held jointly with the Texas Surveyors Association Short Course in Austin, Texas, October 10–13, 1960. More than 300 members were registered at the meeting. Excluding Texas, visitors from nine States (from as far away as New York and California) and Washington, D. C., were in attendance. The program, ably coordinated by V. A. Walston, covered an interesting variety of subjects, with a wide geographic distribution of speakers. Twenty-two firms and organizations had exhibits at the meeting.

Cliff A. Tannahill, President, Gulf Coast Chapter, T.S.A., expressed the general feeling that the joint local meeting was beneficial to both organizations.

V. A. Walston, Chairman Elect of the Texas Section, made a brief statement of appreciation and asked for the cooperation of the membership in the coming year.

New officers for the Texas Section for 1961 are:

Chairman—V. A. Walston
First Vice Chairman—B. D. King, Jr.
Second Vice Chairman—John H. Brownlee
Third Vice Chairman—Earl E. Isaacks
Secretary—Paul W. Wiseman
Treasurer—James W. Harding
Directors (Two-year term)—W. C. Mitchell and Ben I. Still. (Holdover Directors)—Roy C. Brown, Paul A. Lederer, Howard C. Taylor, and Joe A. Hicks.

A meeting of the Executive Board of the Texas Section, ACSM, was held January 11, 1961, in the Conference Room on the 8th floor of the Electric Building, Houston, Texas. The meeting was called to order at 7:30 p.m., with Chairman V. A. Walston presiding and with 11 of the 14 board members present.

Appointment of committee chairman was announced, as follows:

Membership—John H. Brownlee
Public Relations—G. W. Herzog
Program—J. E. Windham
Nominations—O. E. Young
Arrangements and Entertainment—Mario Lozano
Exhibits—Irving H. Webb
PSD Advisor—Tom Dillon

A considerable amount of routine business was disposed of, and the meeting adjourned at 9:12 p.m.

Hawaii Section

At its meeting of December 14, 1960, the Hawaii Section, ACSM, elected the following officers for 1961:

Chairman—Henslee Towill
Vice Chairman—Ernest Nishihara

Secretary-Treasurer—James Chrystal, Jr.
Editor—John Cline Mann
Director—Joseph A. Aiu
The holdover directors are Clarence J. Olds and James M. Dunn.

—James Chrystal, Jr.
Secretary-Treasurer

Personals

Captain **Philip C. Doran,** U. S. Coast and Geodetic Survey (Retired) is now Director, Division of Geodetic Surveys, Department of Conservation and Development, Raleigh, N. C.

We learn from the Southern California Section's *Newsletter* that Professor **Charles R. Herr,** Pasadena City College, was the only survivor from his tent of six in the 1928 San Francisquito Dam break, a tragedy which took over 400 lives. He was surveying for the Edison Company at the time of the disaster.

Rear Admiral Kenneth St. Barbe Collins, C.B., O.B.E., D.S.C., of London, England, recently retired as the Hydrographer of the Royal Navy, has been appointed Consultant to the Surveys and Mapping Branch of the Canadian Department of Mines and Technical Surveys. He will reside in Ottawa.

Dr. **Paul Rosenberg,** Director of Research, Paul Rosenberg Associates, consulting physicists, has been elected a Fellow of the Institute of Radio Engineers. The citation of his award reads: "For contributions to electron physics."

Wilbur E. Camp, formerly teaching at Purdue University, is in Georgetown, British Guiana, with the International Cooperation Administration operations mission to British Guiana, establishing and conducting a technical institute in surveying for that country.

Charles Keck has been appointed a vice president of Aero Service (Bahamas) Ltd., a subsidiary of Aero Service Corporation, and has his headquarters in Beirut.

Deaths

James E. McDonald, of James E. McDonald Company, Engineers, of Knoxville, Tennessee, died on October 12, 1960, at the age of 55 years. He had been in private practice for 16 years, and had done most of the land acquisition work for the big zinc, coal, and iron operations in that area. His most recent design project was the water treatment plant for the Northeast Knox Utility District on the Holston River. The system went into operation just a few months ago, serving 1700–1800 customers and with an ultimate capacity to serve 3600 customers. Previously he had designed and superintended the construction of a system for the West Knox Utility District.

Before going into private practice, Mr. McDonald had worked with Stone and Webster in laying out the sewer and water lines for Oak Ridge, Tennessee. Prior to World War II he spent six years with the U. S. Forest Service as a Junior Civil Engineer for the Cherokee National Forest.

Word has been received at the Central Office, ACSM, that **Rudolph E. Eberle,** 308 Marks Road, Danville, California, died December 23, 1960, as a result of a coronary thrombosis.

Dipl.-Ing. Dr. F. Schiffman, President, Fédération Internationale des Géomètres, died Wednesday, January 25, 1961. Interment in the Vienna Central Cemetery.

(*Continued from page 120.*)

Secretary-Treasurer—Harl V. Pugh, San Francisco
Editor—Anthony F. Bruno, San Francisco
Director—Thomas L. O'Connor, Lower Lake
Holdover Directors are:
C. Merrill Harrington, Santa Rosa
Frank T. Maguire, Potter Valley

William A. White, Executive Director of the California Council of Civil Engineers and Land Surveyors, gave an informative talk on the changes in the Land Surveyors' Act for the past two years and discussed the merits of the proposed changes for the next session of the State Legislature.

The meeting was then turned back to Chairman Godman for brief announcements and adjournment.

—Alvin L. Wilson
Secretary, EBCSM

Alaska Society of Professional Land Surveyors

The Alaska Society of Professional Land Surveyors, having petitioned and qualified for Institutional Membership in the American Congress of Surveying and Mapping, was declared an affiliate of the ACSM as of February 28, 1961.

The Secretary-Treasurer of the ASPLS is Hewitt V. Lounsbury, 711 Sixth Avenue, Anchorage, Alaska.

NEW MEMBERS

AGNOLI, Joseph S., 54 Fair St., Carmel, N. Y.—Land Surveyor

ALBA, Ervin, 5245 Glenloch St., Philadelphia 24, Pa.—Cartographic Draftsman, Penn-Jersey Transportation Study

ALLUMBAUGH, F. R., 6404 Glennox Lane, Dallas 14, Tex.—Engineer-Surveyor

ARITA, Peter H., 1846 Kilohi St., Honolulu, Hawaii—Land Surveyor, Department of Public Works, City and County of Honolulu

AU, Robert H. L., 233 Merchant St., Honolulu, Hawaii—Land Surveyor, R. M. Towill Corp.

BAILEY, Thomas W., P. O. Box 174, Summerville, S. C.—Surveyor, Dorchester Surveying Co.

BAILIN, Michael, 130-12 178th Place, Jamaica 34, N. Y.

BAKER, William M., Jr., OP Division, USS Ticonderoga (CVA-14) FPO, San Francisco, Calif.—Photographic Intelligence, U. S. Navy

BASINSKI, Ignace S., 103 Frontier Drive, Buffalo 19, N. Y.—Land Surveyor

BAY, Wayne D., 5360 Canton St., Long Beach 15, Calif.—Party Chief, Los Angeles County

BEATTY, Francis D., 210 E. Courtland St., Philadelphia 20, Pa.—Photo Analyst and Research Associate, Aero Service Corp.

BENNETT, Howard C., 5200 Marwood Rd., Philadelphia 20, Pa.—Supervisor, Mapping and Drafting, Penn-Jersey Transportation Study

BLOOMGREN, George S., 102½ E. 5th St., East Liverpool, Ohio—Civil Engineer

BONINI, Francis J., 39 Bennett St., Middletown, N. Y.—Civil Engineer, New York State Department of Public Works

BRAMANIS, Arthur K., 3 Devon Drive, Manchester, Conn.—Surveyor, L. S. Green Manor Construction Co., Inc.

BRUDIN, John B., P. O. Box 851, Hemet, Calif.—Civil Engineer, Neste & Brudin

BURRIS, Jack W., 13246 Ha Hana Rd., Lakeside, Calif.—Surveyor, City of La Mesa

BURROUGHS, Lt. (jg) Charles A., 88 Sun Valley Drive, Southington, Conn.—Ships Officer, U. S. C. & G. S.

CARLSON, Robert R., 9755 Cabanas Ave., Tujunga, Calif.—Project Engineer, J. M. Montgomery, Inc.

CARPENTER, Carl M., P. O. Box 65, Nashville, Ind.—Forester and Surveyor

CASWELL, Orville O., 4047 Concord St., Eugene, Oreg.—Land Surveyor, John H. Quiner

CATON, Ronald, P. O. Box 61, Montgomery, Ala.—Sanitary Engineer, U. S. Public Health Service

CHUN, Dorothy N. H., 233 Merchant St., Honolulu, Hawaii—Draftswoman and Computer, R. M. Towill Corp.

COLLETTE, Charles P., 5434 Attaway, North Charleston, S. C.—Field Engineer, West Virginia Pulp & Paper Co.

COMPTON, Phil V., 1516 Tijeras Ave., N.E., Apt. 33, Albuquerque, N. Mex.—Elder Co.

CONLEY, Patrick E., 7004 Gilbert Drive, Shreveport, La.—Civil Engineer and Land Surveyor

COTERA, Augustus S., Route 1, Box 174, Alta Loma, Tex.—Civil Engineer, Corps of Engineers, U. S. Army

DAVIES, A. Bowen, Sullivan Drive, Granby, Conn.—Surveyor

DAVIS, J. Ray, 884 Holly Hill Drive, Walnut Creek, Calif.—Sales Representative, Keuffel & Esser Co.

DECKER, Robert H., 36 Winchester Place, East Haven 12, Conn.—Town Engineer.

DERBY, Walter L., 15 Washington Ave., Pleasantville, N. Y.—Vice President, Chas. H. Sells.

DIXON, O. M., The College, Llandovery, Carmarthenshire, Wales—Schoolmaster

DOBKINS, Eugene P., 301 City Hall, Fort Worth, Tex.—Chief of Surveys, Public Works Department, City of Fort Worth

DONOHUE, Stephen R., 157 Nott St., Wethersfield, Conn.—Engineer, Connecticut Highway Dept.

DOWNES, John A., 1425 33rd St., N.W., Washington 7, D. C.—Engineer, U. S. Bureau of Public Roads

EDISON, Lewis H., Engineering Department, Waseca, Minn.—Acting City Engineer and Street Commissioner

ELLER, Jack L., 11010 N. E. 9th St., Bellevue, Wash.—Land Surveyor

ENGLISH, Edward F., 7827 W. 80th St., Playa Del Rey, Calif.—Party Chief, Los Angeles County

FLEENER, Edgar T., P. O. Box 188, New Palestine, Ind.—Land Surveyor

FOREST, W. F., 405 E. 12th St., Georgetown, Tex.—Surveyor

FORGEY, Alfred L., Brownstown, Ind.—County Surveyor

FROMMHOLZ, Hans E., 2070 Saw Mill River Rd., Yorktown Heights, N. Y.—J. Henry Carpenter & Co.

FROST, William J., 20261 Bayview Ave., Santa Ana, Calif.—Party Chief and Project Supervisor, Raub & Southworth

GAILLARD, W. Lucas, 1 Limehouse St., Charleston, S. C.—Surveyor, Gaillard & Gaillard

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GEOGRAPHICAL DISTRIBUTION OF NEW MEMBERS LISTED ABOVE

Alabama	9	Indiana	8	Nevada	–	Tennessee	1
Alaska	1	Iowa	2	New Hampshire	–	Texas	8
Arizona	2	Kansas	–	New Jersey	–	Utah	1
Arkansas	–	Kentucky	–	New Mexico	2	Vermont	–
California	35	Louisiana	7	New York	16	Virginia	4
Colorado	1	Maine	–	North Carolina	3	Washington	1
Connecticut	23	Maryland	1	North Dakota	–	West Virginia	1
Delaware	–	Massachusetts	1	Ohio	5	Wisconsin	1
District of Columbia	2	Michigan	7	Oklahoma	–	Wyoming	–
Florida	–	Minnesota	1	Oregon	1	Total	183
Georgia	1	Mississippi	–	Pennsylvania	16		
Hawaii	11	Missouri	–	Rhode Island	–	Foreign	5
Idaho	–	Montana	1	South Carolina	5		
Illinois	4	Nebraska	1	South Dakota	–	Total	188

GEOGRAPHICAL DISTRIBUTION OF NEW MEMBERS LISTED IN THE FOUR NUMBERS OF VOLUME XX

Alabama	20	Indiana	3	Nevada	1	Tennessee	1
Alaska	18	Iowa	5	New Hampshire	1	Texas	31
Arizona	44	Kansas	15	New Jersey	7	Utah	12
Arkansas	—	Kentucky	3	New Mexico	21	Vermont	—
California	108	Louisiana	36	New York	31	Virginia	38
Colorado	45	Maine	5	North Carolina	9	Washington	14
Connecticut	11	Maryland	37	North Dakota	—	West Virginia	1
Delaware	8	Massachusetts	18	Ohio	20	Wisconsin	6
District of Columbia	11	Michigan	28	Oklahoma	4	Wyoming	1
Florida	33	Minnesota	5	Oregon	11	Total	925
Georgia	4	Mississippi	—	Pennsylvania	28	Foreign	46
Hawaii	32	Missouri	119	Rhode Island	—		
Idaho	2	Montana	2	South Carolina	1	Total	971
Illinois	35	Nebraska	17	South Dakota	6		

Modern Photogrammetric Equipment Installed at Cornell University

The Surveying Department of the School of Civil Engineering, Cornell University, Ithaca, New York, has announced the addition of a first-order stereoplotter, Wild A7 Autograph with Wild EK3 Electric Coordinate Printer, to its teaching and research facilities in photogrammetry. It is the first such equipment to be placed in an engineering school in the United States and was placed in service on January 31, 1961.

The EK3 Electric Coordinate Printer enables an operator who observes ground points in the photographs in three dimensions to have the *X*, *Y*, and *Z* positions of these computed and printed out by merely depressing a button. Appropriate attachments enable the ground position and elevation above sea level to be put on paper-tape or punch-cards so the data are ready for subsequent computations with an electronic computer. The Cornell Computing Center is well equipped with a modern high-speed computer and complete auxiliary equipment to take full advantage of the A7 Autograph.

By still another arrangement of the Wild A7 plotter, the precise coordinates of the image points of the photographs can be measured. These coordinates can then be further processed in an electronic computer to provide solutions of analytical aerotriangulation problems using mathematical relationships developed at Cornell University as a part of sponsored and unsponsored research projects. The presence of a first-order plotter at the school provides an additional capability for further research and development in analytical photogrammetry.

One of the components of the instrument consists of a precision rectangular coordinatograph for use in plotting points rapidly, as for maps, profiles, grids, and graphs with extreme precision.

The stereoplotter will be used for basic instruction for undergraduate students in civil engineering, and more extensively for instruction of graduate students in photogrammetry. Cornell is one of but a handful of schools in the United States giving graduate work at both the masters and Ph.D. levels in photogrammetry and geodesy, and this new facility will enhance the teaching program.

Although this is the first precision plotter at an engineering school in the United States, there are a number of such instruments at mapping and scientific centers in this country. These are primarily at Federal, and State mapping agencies and highway departments, and at photogrammetric and civil engineering companies.

As in all colleges, the instruction and internal research load does not require the full-time use of facilities such as these. It is hoped that Cornell can provide a substantial service to government and commercial engineering and research groups. There will be time available to use the Wild A7 and related facilities for special research problems which are difficult to perform at regular commercial production plants. The equipment will be available for special, large-scale mapping which cannot be done by less accurate instruments. It is also hoped that by proper scheduling it may be possible for an organization to relieve an overload period in its own plant by use of these facilities.

Annual Financial Statement

(As of December 31, 1960)

INCOME

Dues and memberships received	*1959*	*1960*	*Year ending 12/31/59*	*Year ending 12/31/60*	*Difference*
Individual	5276	5645	$26,645.40	$28,477.64	+$1,832.24
Library and sustaining	717	558	4,168.26	3,650.03	– *518.23*
Previous years dues			98.00	103.00	+ 5.00
Total	5993	6203	30,911.66	32,230.67	+ 1,319.01
Publication sales			444.79	366.85	– *77.94*
Advertising			6,625.73	5,683.24	– *942.49*
Other income			1,924.66	2,139.87	+ 215.21
Annual meeting			5,301.69	5,450.06	+ 148.37
OPERATING INCOME			45,208.53	45,870.69	+ 662.16

EXPENDITURES

Journal	20,522.23	22,081.79	+ 1,559.56
Salaries, office expenses, etc.	15,926.58	18,115.24	+ 2,188.66
Travel	1,279.88	917.59	– *362.29*
Technical divisions	2,321.66	3,107.47	+ 785.81
Other authorized expenditures	282.25	1,170.35	+ 888.10
TOTAL EXPENDITURES	40,332.60	45,392.44	+ 5,059.84
NET INCOME	4,875.93	478.25	– *4,397.68*

ASSETS

Bank balance	18,865.35	14,495.77	– *4,369.58*
Bonds and savings accounts	62,232.19	68,903.25	+ 6,671.06
Property	4,545.71	5,266.93	+ 721.22
Advance payments	857.61	581.81	– *275.80*
Accounts receivable	1,938.95	1,500.00	– *438.95*
Accrued bond interest	—	38.37	+ 38.37
TOTAL ASSETS	88,439.81	90,786.13	+ 2,346.32

LIABILITIES AND NET WORTH

Advance dues paid	11,674.00	12,747.35	+ 1,073.35
Accounts payable	4,658.96	5,453.68	+ 794.72
TOTAL LIABILITIES	16,332.96	18,201.03	+ 1,868.07
NET WORTH	72,106.85	72,585.10	+ 478.25

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Why Is It That Invariably:*

the rear lot stake falls in the center of a thorn bush;

the fat lady walks on your transit line for blocks, and it seems like hours;

the excavator piles earth 20 feet high on the street line;

the client's neighbor always burns his leaves when you are waiting to measure the angle;

the only tree in sight happens to be in the way;

the rains come just when you reach the job;

the rains stop just when you get back to the office;

the most important stake on the whole survey strikes a stone and goes crooked;

children and dogs play "ring-around-the-transit";

the hill is much steeper going up than it is coming down;

with a dozen spaces available, a car is suddenly parked right on line; and

the job is much more difficult than it seemed on paper.

* Quoted from the Wisconsin Society of Land Surveyors' *Newsletter* of January 25, 1957.

The XIXth International Geographical Congress and International Congress on the History of Discoveries

The Xth General Assembly and XIXth International Geographical Congress of the International Geographical Union were held at Stockholm August 5-13, 1960. More than 1,700 geographers and cartographers registered from 64 countries. Approximately 600 papers were read and discussed at nine Section and fifteen Commission meetings. In addition, there were pre- and post-Congress symposia and field trips, extensive map and atlas exhibits, and the usual social functions for an international scientific meeting.

Eleven additional countries were admitted to the International Geographical Union this year, bringing the total to 53. The new members are Australia, Bulgaria, (East) German Democratic Republic, Guinée, Iraq, Iran, Malaya, Rumania, South Africa, South Korea, and Tunisia. Hong Kong and Singapore were admitted as Associate Members. A motion was passed to drop Colombia and Cuba if back dues are not paid by the end of this year.

Officers for 1960–64 are:

President—Carl Troll, Germany

Past President—Hans Ahlmann, Sweden

Vice-Presidents (2nd term)—H. Awad, Morocco, C. Harris, U.S.A., and F. Tada, Japan

Vice Presidents (new)—K. Cumberland, New Zealand, S. Guerassimov, USSR, and P. Monbeig, France

All fifteen of the existing Commissions of the Union were continued to 1964. They cover the following fields: Land Use Surveys; National Atlases; Population Maps; Cartes Anciennes; Library Classification of Geographical Books and Maps; Karst Regions; Evolution of Slopes; Arid Zones; Medical Geography; Periglacial Morphology, Erosion Surfaces around the Atlantic; Coastal Morphology; Applied Geomorphology; Humid Tropics; and the Teaching of Geography. Two new Commissions were added this year: (1) Methods of Regionalization and (2) Cartography.

Nearly one third of these Commissions pertain to some aspects of mapmaking or map use. The one of most direct concern to the American Congress on Surveying and Mapping is the new Commission on Cartography. Largely in response to a request from the International Cartographic Association, the International Geographical Union created the new Commission on Cartography as a step toward merging the organizations. To achieve more official status as an international organization, the Cartographic Association needs to affiliate with some existing organizations such as ICSU (International Council of Scientific Unions) or the International Geographical Union. The IGU could not accept the International Cartographic Association as one of its commissions and still leave the ICA free to select its own officers, arrange its own technical meetings, and operate in an independent fashion without some changes in the IGU constitution. Consequently ICA will continue on an informal basis but its relation to the IGU will be strengthened because the Chairman of the new Commission on Cartography (Professor Imhoff) and two of his committee members (Mannerfelt and Fitchet) are also officers of the ICA. Meanwhile, consideration is being given to alternates of the U. S. National Committee for the IGU to permit representation from the American Congress on Surveying and Mapping as there now is from the Association of American Geographers, the American Geographical Society, the National Geographic Society, and various federal agencies.

The Commission on the Library Classification of Geographical Books and Maps adopted resolutions requesting its members to urge library associations, library schools, and administrators of large libraries:

1. To consider the desirability of alternative classification schedules for the segregation of geographic and cartographic works in libraries;

2. To improve and coordinate works of international scope in the fields of geography and cartography; and

3. To have commission members monitor new catalog cards in their respective countries to prevent the erroneous cataloging of geographic and cartographic works as parts of other disciplines.

The Commission on Historical Maps (Cartes Anciennes) is being continued largely to serve as a holding company for the management of *Imago Mundi*. That outstanding journal of historical cartography lapsed after the deaths of its founder (Dr. Bagrow, in 1957) and editor (Roukema, in 1959). It was hoped that R. A. Skelton of the British Museum would take a

leading part in reorganizing the management and publication of the journal.

The International Congress of the History of Discoveries was held at Lisbon, September 5–11, as part of extensive celebrations throughout Portugal to commemorate 1960 as the 500th anniversary of the death of Prince Henry the Navigator. There were simultaneous section meetings on Cartography, Nautical Science, Voyages of Discovery, Causes and Consequences of the Discoveries, Overseas Expansion until the end of the 16th Century, Expansion in the 17th and 18th Centuries, and The Civilizing Process of the 19th and 20th Centuries. Many of the papers revealed or suggested the existence of Portuguese voyages and maps previously unknown to many scholars. They also deflated the prestige of Martin Beheim as a scholarly globe maker, strengthened concepts about John Cabot's voyages across the North Atlantic in 1497 and 1498, and traced the source of many early Italian navigation charts to Portuguese charts that are no longer extant.

The Congress established a Committee on the Preservation of Ancient Charts and Maps to seek practical means for their preservation (probably by film negatives) and improved use through interlibrary loan and photoreproduction. The proposal for such a committee originated through a paper presented by Miss Ena Yonge of the American Geographical Society. Members of the committee include Mlle. Foncin of the Bibliothèque Nationale at Paris, R. A. Skelton of the British Museum, Arch C. Gerlach of the Library of Congress, G. R. Crone of the Royal Geographic Society, Avelino Teixeira da Mota of Portugal, and T. E. Layng of Canada.

The Chairman of the Section on Cartography noted with pleasure that heads of eight of the world's largest and most famous map libraries were present and announced his conviction that most of the papers on historical cartography were carefully prepared, soundly documented, and presented challenging theoretical considerations which resulted in discusisons at a high professional level.

Cartographic exhibits supplemented the Congress where approximately 600 scholarly papers were presented and discussed. A special exhibit containing 50 of the world's earliest and rarest map treasures was set up in the Museum of Modern Art near the Tower of Belem. Another exhibit of more than 700 manuscript maps and rare printed maps of Brazil and Portuguese colonies was displayed at the Military Museum.

A monumental publication of outstanding significance in the field of historical cartography was prepared in connection with this Congress. *Portugaliae Monumenta Cartographica,* is a five volume work (61 × 48 cm.) with more than 700 plates and some 1,500 specimens of Portuguese cartography in the 15th and 16th Centuries. Fifty of the plates are in full color. The descriptive and analytical text is in both Portuguese and English. The first four volumes were published in 1960 and are now available for reference use in the Map Reading Room at the Library of Congress. When Volume 5 has been finished, complimentary sets of this work will be sent to many large libraries in the United States.

—Arch C. Gerlach

Library of Congress

Keuffel & Esser Fellowship in Surveying

ACSM secretariat reports that eight valid applications have been properly filed under the rules governing the Keuffel & Esser Award in Surveying.

ACSM President, Rear Admiral H. Arnold Karo, has appointed the following K & E Award Committee to select the winner from among the applicants. The name of the winner will be announced during the ACSM 21st Annual Meeting at the March 1961 ASP-ACSM Convention.

Brother B. Austin Barry, *Chairman*
Carl W. Keuffel
Henry W. Hemple
Walter S. Dix, *Secretary Exofficio*

The applicants (in order received) are:

Gordon Gracie	Urbana, Ill.
George E. Kattouah	Detroit, Mich.
Atef A. Elassal	Urbana, Ill.
LeRoy H. Sommers	Milwaukee, Wis.
James L. Clapp	Madison, Wis.
Lee Durward Miller	Ann Arbor, Mich.
Robert A. Nack	Urbana, Ill.
Martin C. Fisher	Lexington, Va.

University Extension Service to Surveyors

For many years, the University of Illinois has been conducting extension classes throughout the State on surveying and related topics. Currently there are courses being conducted on Property Surveying and Photogrammetry. It is possible to arrange for courses on almost any topic from Elementary Surveying to Advanced Geodesy.

All that is essential to promote such a course is to contact 15 persons or more who would care to enroll, select a time, and make a request. Such requests should be mailed to Prof. Scott B. York, 205 Arcade Building, University of Illinois, Urbana, Illinois. Plans should be made early so that transportation can be arranged.

The Illinois Surveyor
(December 1960)

Commemorative Stamp Drive

J. Stuart Boyles, our stalwart member from Texas who has been the leading force in ACSM's drive toward a commemorative stamp in recognition of surveyors, advises ACSM secretariat that the new Vice President of the United States, Lyndon Johnson, (also from Texas) has assured him that the matter will be placed before the Postmaster General for consideration.

NOW! is the time for every member of the ACSM to write individually to his Congressman and for all organized Sections and Affiliates of the ACSM to relay formal support of the idea to the Postmaster General, James Edward Day.

Let's Go!

Second Land and Construction Surveyors Conference

The Second Land and Construction Surveyors Conference was held January 16–18, 1961, at University Park, Pennsylvania. Seventy-four persons were registered at the conference, and the spread was good with respect to both location and fields of interest. Lively discussion from the floor was a feature of the sessions, and, in one case, the discussion had to be cut off because of time limitations.

The conference covered a wide variety of subjects, including lectures on and demonstrations of electronic computers, legal liability, a two-year curriculum in surveying, sessions on various phases of photogrammetry, and a panel discussion of subdivision planning.

Rijkswaterstaat Communications

An unusually well printed publication, bearing the general title "Rijkswaterstaat Communications," has been received. The publication is entirely in English (except that the summaries are in both French and English) and contains two papers which could be of considerable interest to engineers and surveyors in this country. This is Number 1 of a new series and contains "Tidal Computations in Shallow Water," by J. J. Dronkers and J. C. Schönfeld; and "Report on Hydrostatic Levelling Across the Westerschelde," by A. Waalewijn. We believe the best way to cover this publication for our readers is to quote the foreword and the summaries of the two papers. —EDITOR

FOREWORD

The Netherlands governmental civil engineers organisation, called Rijkswaterstaat, has the pleasure of presenting this the first number of a new series which describes the mathematical methods now in use to calculate the changes of tides and tidal or non-tidal currents during and after the execution of works which will influence them. The experience gained since 1920, when Prof. H. A. Lorentz started his well-known mathematical prediction about the influence of the Zuiderzee dam upon the tides and storm-surges, has steadily increased. His method has been used extensively since then and various other mathematical methods have been added, so that there are now a few of them which can

check each other. From these the expert may choose the method most suitable for the problem under review.

The Delta works (1953 till about 1980) require very precise tidal calculations based on equally precise data obtained from the gauges. For this reason the basic data obtained from the gauges should be quite accurate, especially in the southwestern part of the Netherlands, where the new works have started, which will close all the estuaries except the Westerschelde and the Rotterdam Waterway. The first is too wide to be able to be crossed by optic levelling, hence the necessity of the hydraulic levelling across this estuary, also described in this volume.

It is my sincere wish that the new series, to be issued at irregular intervals, may render good service in the international field of civil engineering.

The Director-General,
A. G. Maris.

SUMMARY

A survey is given of the established practice of tidal computations in the Netherlands.

The dynamical analysis of tidal elevations and currents in shallow waters is of great practical interest when coastal engineering projects are undertaken, like the Zuiderzee or the Delta project, both in the Netherlands.

Tidal computations have to be based upon a careful schematization of the region considered. The water is assumed to move substantially in the length direction of a channel with variable cross-section or in a channel network. The problem is then governed by two partial differential equations, the continuity equation and one dynamical equation.

These equations generally are too complicated to admit solutions in closed form. Several methods of numerical approach have therefore been devised.

First among these methods are the harmonic methods, by which one or more tidal constituents are computed. If confined to one single constituent (M2), this method is relatively simple to handle and it requires a moderate effort of calculation. The computation of further constituents leads to progressively increasing efforts, so that the method is seldom extended beyond the second harmonic (M4).

For the immediate numerical integration of the continuity and the dynamical equation, several ways may be followed. A method based on an iterative process has been extensively used for practical problems in the Netherlands and abroad. This method is particularly suited to analyse tidal motions in connection with the problem of schematization.

A third group of methods is based upon the properties of the characteristic elements of the differential equations. Integration, performed either graphically or numerically, is in particular used in specific propagation problems, such as wave motions produced by sluicing operations and bores.

The employment of large computers, either analogue or digital, is here mentioned only briefly, since more detailed information on the development is being prepared.

SUMMARY

In 1952 the Surveying Department of "Rijkswaterstaat" carried out a hydrostatic levelling across the "Westerschelde," using an underwater gas-pipe of 10 cm diameter and a length of more than 4 km. Great difficulties had to be overcome in filling the pipe completely, because a large air-bubble formed in the middle of the nearly W-shaped longitudinal profile of the pipe. Finally this air-bubble could be removed by fitting taps and moving the water mass by means of a big pump. The observations were carried out from Dec. 16 to Dec. 24, 1952. The water level in the pipe ends was measured by means of automatic water-gauges recording on scale 1:1.

Microbarometers were used in measuring the atmospheric pressure at both ends of the pipe. It appeared, however, that these observations were useless; therefore the correction for difference in atmospheric pressure had to be obtained from data of the adjacent meteorological stations. Bottom-temperatures in the Westerschelde could be measured only once. The results of this measurement were such that no corrections for difference in density were necessary.

The standard deviation of a single observation of the (corrected) height difference was 1.1 mm. The average result of the hydrostatic levelling has a standard deviation of 0.2 mm. By this levelling a 120 km. long circuit from Zuid-Beveland via Woensdrecht and Antwerp to Zeeuws-Vlaanderen was closed. The misclosure of this circuit was 0.3 mm. Further the report gives the results of some experiments: The swinging of the water mass after disturbance of balance, the influence of low tide and high tide on the capacity of the pipe and a nonstop series of microbarometer-readings.

Correspondence should be addressed to: Rijkswaterstaat, Koningskade 25, The Hague, Netherlands.

Space Science Board Report Stresses Need for Scientific Exploration of the Moon and Planets

Satellites and space probes may some day enable man to determine the origin and evolutionary history of the solar system. This compelling scientific reason for the study and exploration of the Moon and the planets is discussed in two sections published March 29, 1960, as the first part of a technical report on "Science in Space" being prepared by the Space Science Board of the National Academy of Sciences.

The chapters issued, entitled "The Moon" and "The Planets," were prepared for the Board by one of its members, Dr. Harold C. Urey, Nobel Prize-winner and Professor at Large of the University of California at La Jolla. Dr. Urey is Chairman of the Space Science Board's Committee on Chemistry of Space and Exploration of Moon and Planets.

The chapters on the Moon and the Planets summarize current views on these space companions of the Earth; areas of uncertainty and controversy are noted, as well as facts which seem to be well established. The sections also contain suggestions for lunar and planetary studies worthy of major emphasis in the national space effort.

Dr. Urey reviews what we know of the Moon and the planets and concludes that information on their atmospheres, surfaces, interior structures, and magnetic fields, radioed to Earth from scientific instruments near or on these celestial bodies, may resolve many of the existing uncertainties concerning the last four and one-half billion years. It is even possible that these lunar and planetary studies will lead to one of the most fascinating discoveries of all modern science: evidence of present (or extinct) life on these planets. This possibility is only one of many beckoning men into space on a quest to unravel the puzzles of the universe.

THE MOON

Since there has been no erosion by running water on the Moon, Dr. Urey believes that it has retained more of the history of the past than is characteristic of the planets, and is therefore, from this point of view, a much more important object of investigation. One of the most interesting opportunities presented by the Moon is a chance to investigate in particular one of the hypotheses concerning the origin of the solar system. According to this suggestion, the Moon may be a primitive type of object similar to those which may have existed in large quantities early in the history of the solar system; the existence of such objects may have been an important part of the evolution of the system. It may be possible to prove or disprove this hypothesis by the studies proposed in this chapter.

The report envisages that a satellite orbiting some sixty miles above the Moon's surface will be able to determine many aspects of the composition of the surface, add to our knowledge of the relationships of maria and land areas through high-resolution television, secure data on the density and composition of the Moon's atmosphere, explore the lunar magnetic field, and test for a lunar "Van Allen radiation belt" effect. Studies of the orbital constants of the satellite would establish the mass of the Moon and its mass distribution.

Later, hard-landing and soft-landing lunar probes will provide opportunities for surface experiments. Included among the more than a dozen experiments suggested are television of the surface of the Moon as seen through a microscope, testing of the surface for magnetic substances, hardness and depth studies by means of probes, seismic observations, temperature measurements, and chemical and spectroscopic analysis of surface rocks. It is suggested that samples (both surface and core) be returned to Earth from many locations. Among other things, this would permit determination of the age of the surface of the Moon by the potassium-argon radioactive dating method.

Ultimately, man himself will attempt to reach the Moon. The report emphasizes the importance of the scientific qualifications of the first man to go to the Moon. Dr. Urey recommends that he be primarily trained in geology, but that he also have a considerable knowledge of several other fields of science.

THE PLANETS

The chapter on the planets deals with Mercury, Venus, Mars, Jupiter, the asteroids and the comets.

Suggested experiments include television observation of many features of the solar system, either near the planets or on their surfaces; studies of the mass, shape, surfaces, and internal structure of the planets; studies of the temperature, pressure, depth, chemical composition and ionic effects of their atmospheres; and a variety of biological tests. Mars would appear to be

the most appropriate planet for the latter tests, for Dr. Urey concludes that there is a reasonable expectation that life does exist on Mars, although probably not in the active forms found on Earth. An investigation of this question, the report states, is of first importance in the nation's space program.

The report also suggests that efforts be made to land instruments for chemical analysis and seismic observations on the cold side of Mercury; the other side is so hot it is doubtful that radio equipment could function properly there.

The purpose of the Space Science Board's report, "Science in Space," is largely two-fold; to review areas and opportunities for important research studies using space vehicles and to suggest what now appear to be major areas of emphasis for the national space effort. The report, written by leading scientists who are, in the main, members of the Board, outlines the potentials of space science for the immediate future with a view toward encouraging broad participation in space research at every level of American scientific activity.

The complete report will consist of nine chapters. In addition to the two already issued, other titles are: "Physics of Fields and Energetic Particles in Space"; "The Nature of Gravitation"; "The Earth"; "The Sun"; "The Biological Sciences and Space Research"; "Galactic and Extra-galactic Astronomy"; and "A General Review."

Each chapter will be available from the Printing and Publication Office of the National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington 25, D. C., for $1.00.

The Space Science Board of the National Academy of Sciences was established in 1958. Its primary purpose is to study scientific research opportunities and needs opened up by the advent of rockets and satellites as tools for research; to give advice and recommendations on space science to interested agencies and institutions; to stimulate research in the rocket and satellite fields; and to cooperate with scientists in these fields in other countries, particularly through the Committee on Space Research (COSPAR), established in 1958 by the International Council of Scientific Unions.

New Vessel for Canadian Hydrographic Service

Something new in the way of hydrographic vessels, an inshore survey unit, will make its appearance in the fleet of the Canadian Hydrographic Service next spring, in time for 1961 operations in Canada's coastal waters.

Mines and Technical Surveys Minister, Paul Comtois, describes it as a new type hydrographic ship which boasts the valuable features of being especially designed for inshore survey work. It will, in fact be a unit which is intermediate in size between a launch as used by a land-based shore party and a fully staffed ship. It is expected to be especially valuable for work along the more rugged and isolated parts of Canada's eastern seaboard.

The new craft will have a range of over 2,000 miles and a speed in excess of 12 knots. It will be capable of carrying and providing living accommodations for a crew of 20 persons. It will have the latest in navigational aids and many of the amenities of modern living. Moreover, it will be a "launch" carrying launches, for it will be equipped with two 26-foot launches, each with inflatable life rafts. Initially it will work off the south coast of Newfoundland and later off the coast of Labrador.

The vessel will cost an estimated $450,000. A contract for its construction has been let to Halifax Shipyards Limited at Halifax. An inshore vessel, of steel, it will be an attractive looking craft of the raised forecastle type, with raised wheelhouse and deckhouse amidships. It will be 115 feet over-all in length, with a breadth of 26 feet.

It will have twin screws and twin rudders for good maneuverability. The two engines will be about 350 horsepower each. Its navigational aids will include a gyrocompass, radar, and radio telephone ship to shore, and it will have automatic steering.

The vessel's additional feature of carrying launches will give the surveyors aboard three working craft in one package. Its deck machinery, including the boat hoists, will be hydraulically operated to facilitate work in icy weather.

The new ship will permit some oceanographic research to be carried out on board in a small laboratory which will be provided for this purpose. The normal duties of the vessel, however, will be hydrographic.

The new vessel will be named the *C. H. S. Maxwell* in honor of the late Staff Commander W. F. Maxwell of the Royal Navy who was in charge of the first detailed survey of the coasts along which the new vessel will be working.

APPLICATION FOR MEMBERSHIP

I am interested in surveying and mapping and hereby apply for membership in the American Congress on Surveying and Mapping. I enclose $5.00 (U. S. and Possessions), $6.00 (Foreign) in payment of annual dues.

Name (Please type or print) .....

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Mailing Address .....

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Occupation and Organization .....

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Branches of surveying and mapping preferred .....

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Reference. If registered, please indicate .....

.....

Applicant's Signature ..... Date .....

(Send to: Chairman, Membership Committee,
Room 430 Woodward Building, 733 15th Street, N.W., Washington 5, D. C.)

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